3.0 ENVIRONMENTAL ANALYSIS

3.1 GEOLOGY

3.1.1 Physiography

3.1.1.1 Existing Environment

The Islander East Pipeline Project is located within the New England Upland section of the New England physiographic province and the Embayed section of the Coastal Plain physiographic province. The current landforms and landscapes encountered by the proposed route are primarily the result of late Quaternary glacial events that ended approximately 12,000 years ago. Table 3.1.1-1 lists by state and milepost, the geologic features along the pipeline route.

Connecticut

Algonquin's AGT Pipelines Retest activities would take place in broad glacial valleys and terraces. The onshore portion of the Islander East Pipeline would cross irregular plains and hills. Elevations along the proposed pipeline route range from 0 to 120 feet above sea level and are typically 30 to 100 feet above sea level.

Surficial geology in the project area is predominantly sandy to loamy till, sand, and gravel. Post-glacial sediments, primarily floodplain and swamp deposits, make up a lesser portion of the unconsolidated surficial deposits. Although the thickness of the surficial deposits generally varies between 10 to 50 feet or more, several areas have been identified where shallow bedrock may occur along the route (see table 3.1.1-1). Underlying bedrock consists of sedimentary arcose, shale, granite, gneiss, and schist.

Long Island Sound

The Sound is one of the largest estuaries along the Atlantic coast of the United States. The Islander East Pipeline Project crosses the Sound between MPs 10.2 and 32.8. The Sound is a semi-enclosed, northeast-southwest trending basin that is approximately 113 miles long and 20 miles across at its widest point. Its mean water depth is approximately 80 feet. The eastern end of the Sound opens to the Atlantic Ocean through several large passages between islands, whereas the western end is connected to New York Harbor through a narrow tidal strait. The Connecticut River is the main source of sediments to the Sound.

The Islander East Pipeline Project would cross the central part of the Sound. In this area the bottom generally consists of broad areas of smooth sea floor that slope toward an east-west axial depression which has depths of 100 to 200 feet. The pipeline would cross near the eastern-most end of this depression near MP 28 in approximately 130 feet of water. Bottom sediments typically consist of very fine sand and mud.

TABLE 3.1.1-1
Geologic Features Along the Islander East Pipeline Route

	Mileposts	Geologic Features	Topographic Features (Elevation Range in feet)	Shallow Depth to Bedrock [a] (MP)
CONNECTICUT – AGT Pipelines Retest and Anomaly Investigations (Onshore)	0.0 to 13.3	Sand and gravel, lake sediments, and alluvium. Sandstone and basalt.	Broad valleys and terraces (20 to 350 feet; typically 150 to 250 feet).	N/A
	13.3 to 13.7	Sandy/loamy till, sand, and gravel. Sandstone and basalt.	Irregular plains and hills (20 to 350 feet; typically 20 to 40 feet).	N/A
CONNECTICUT – Islander East Pipeline (Onshore)	0.0 to 10.2	Sandy/loamy till, sand, and gravel. Sandstone and basalt to MP 6.0. Gneiss, granite, and schist (MP6-10.2).	Irregular plains and hills (0 to 120 feet; typically 30 to 100 feet).	0.17 to 0.22 0.25 to 0.53 2.36 to 2.49 2.84 to 2.97 8.67 to 8.74 8.97 to 9.25 9.67 to 9.84 10.06 to 10.13
LONG ISLAND SOUND – Islander East Pipeline (Offshore)	10.2 to 32.8	Sand, silt, and clay.	Primarily smooth sea floor (100 to 200 feet below sea level).	10.39 to 10.42 [b] 10.74 to 10.75 [b] 10.81 to 10.82 [b] 11.79 to 11.83 [c]
NEW YORK – Islander East Pipeline and Calverton Lateral (Onshore)	32.8 to 44.8 CA0.0 to CA5.6 [d]	Gravel, sand, and silt and sandy to clayey till.	Plain, low hills (0 to 150 feet; typically 60 to 100 feet for the Islander East Pipeline and 85 to 110 feet for the Calverton Lateral).	N/A

a/ Shallow depth to bedrock identifies areas where bedrock is less than 5 feet below the surface.
b/ Area crossed by horizontal directional drilling.
c/ Potential bedrock or glacial till below unconsolidated sediment.
d/ Mileposts for the Calverton Lateral are preceded by "CA" to distinguish them from mileposts on the Islander East Pipeline.
N/A Not Applicable

Small knolls and low ridges of rock locally protrude above the smooth Sound floor, especially along the Connecticut coastline and outcrops are common southeast of Branford. Individual outcrops typically have north-south orientations that mirror onshore topographic trends. Along the pipeline route, scattered areas of sea floor or shallow depth to bedrock may exist between MPs 10.3 and 11.9 (see table 3.1.1-1).

Long Island, New York

On Long Island, the proposed pipeline would cross plains and low hills. Along the Islander East Pipeline route, elevations generally range between 60 and 100 feet above sea level, with elevations ranging from 85 to 110 feet above sea level along the Calverton Lateral. Surface geology consists of gravel, sand, silt, and sandy to clayey till as well as beach and marsh deposits. Because the minimum depth to bedrock is greater than 400 feet, no bedrock should be encountered during construction on Long Island.

Aboveground Facilities

The project's aboveground facilities include one compressor station (which includes the launcher relocation), three meter stations, and five mainline valves. Because these facilities would be located within or adjacent to the right-of-way, geologic resources and potential geologic hazards associated with these facilities would be the same as those described for the proposed pipeline route. There are no known geologic conditions or resources that would limit, be impacted by, or require special mitigation as a result of aboveground facility construction at the proposed locations.

3.1.1.2 Environmental Consequences

The proposed facilities on Long Island in New York would cross areas characterized by thick (at least 400 feet), unconsolidated sediments and therefore blasting of bedrock is not anticipated. Similarly, Algonquin has not identified areas of shallow bedrock and therefore does not anticipate any blasting. However, as shown on table 3.1.1-1, approximately 1.2 miles of the proposed route in Connecticut and 0.1 mile in the Sound near the Connecticut shore would be located in areas where shallow bedrock is likely present. Several commentors expressed concerns about blasting in these areas.

If bedrock is encountered onshore, Islander East would attempt to break up the rock using standard construction equipment. If this method fails, blasting would be required. If not properly controlled, blasting can cause damage to structures, existing pipelines and other utilities, and wells. Temporary effects of blasting could include hazards posed by uncontrolled flying pieces of rock, nuisances cause by noise, and increased fugitive dust emissions. Proper use of blast matting and time-delayed charges would minimize potential fly-rock hazards.

Blasting activities would be performed by a licensed blasting contractor and would strictly adhere to all local, state, and Federal regulations applying to controlled blasting and blast vibration limits in regard to structures and underground utilities. Prior to construction, Islander East would contact each municipality along the pipeline route to determine local ordinances or guidelines for blasting. Islander East would follow procedures specific to each jurisdiction.

With landowner permission, Islander East has offered to conduct a pre-blast survey to assess the conditions of structures or wells within 200 feet of the construction right-of-way where blasting is anticipated. The survey would include:

- Informal discussions to familiarize the adjacent property owners with blasting effects and planned precautions to be taken by Algonquin and Islander East;
- Determination of the existence and location of site-specific structures, utilities, and water wells;
- Detailed examination, photographs, and/or video records of adjacent structures and utilities; and
- Detailed mapping and measurement of large cracks, crack patterns, and other evidence of structural distress.

During blasting, Islander East would monitor ground vibrations at the nearest structure or water well that is within 200 feet of the blast site. Recording seismographs would be installed by the contractor at selected monitoring stations under the observation of Islander East personnel. During construction, the effects of blasting would be monitored at the closest adjacent structures by seismographs that record both the frequency and peak particle velocity. The maximum ground displacement would be estimated from the measured values of frequency and peak velocity. The contractor would submit reports for each blast and keep detailed records of charge weight, location of blast point and distance from existing structure, delays, and response indicated by seismographs.

Should the property owners identify any damage or change to the properties, or if excessive peak particle velocities have been recorded during the blasting operations, Islander East would either repair the damage or compensate the owner for damages that result from blasting. Islander East may make an additional post-blast survey of the affected properties to verify property damage.

For underwater areas, blasting would be necessary in areas of bedrock that cannot be avoided or trenched by other methods. The HDD endpoint as planned off the Connecticut coast would eliminate all but the farthest offshore portion of potential shallow bedrock (from MP 11.79 to 11.83) as the offshore area that has potential for blasting. Blasting would be conducted using delays of a fraction of a second per hole and placing rock into the top of the borehole to dampen the shock wave reaching the water column. The nature of the material that would require blasting, the limited areas where blasting would be required, and the short duration of blasting activities would combine to minimize the amount of fine-grained material that would be released into the water column. Other proposed mitigation measures to minimize increases in turbidity in the water column due to blasting, and expected potential impacts to water quality, are further discussed in section 3.3.3, Long Island Sound. Similarly, potential impacts to marine organisms are discussed in section 3.4.1, Fisheries Resources.

An approved, licensed blaster would direct offshore blasting operations and no charge would be detonated without his/her approval. Loading tubes and casing of similar metals would be used in order to reduce the possibility of electric transient currents from galvanic action of dissimilar metals and water. Only water-resistant blasting caps and detonating cords would be used for marine blasting. Where needed, loading would be done through a non-sparking metal loading tube. No blasting would occur within 1,500 feet of moving vessels except those associated with the blasting operation. Captains or other responsible persons on board vessels or craft moored or anchored within 1,500 feet would be notified before a blast is fired. No blast would be fired while any swimming or diving operations are in progress in the vicinity of the blasting area. If diving operations are in progress, signals and arrangements would be agreed upon to assure that no blast is fired while any person is in the water near the blasting operations. The storage and handling of explosives aboard vessels involved in underwater blasting operations would be in accordance with Federal, state, and/or local provisions on handling and storing explosives. When more than one charge is placed under water, a floatation device would be attached to an element of each charge in such a manner that the float would be released by the firing. Misfires detected by this procedure would be handled in accordance with Federal, state, and/or local requirements.

We believe that blasting, as discussed above, in accordance with all applicable regulations, would cause only short-term impacts and no significant long-term impacts to the environment.

3.1.2 Mineral and Paleontological Resources

3.1.2.1 Existing Environment

Exploitable mineral deposits in the vicinity of the proposed facilities include clay, sand, gravel, crushed stone, and dimension granite. Past mineral production in the project region included dimension sandstone, copper, and barite. Most of these operations no longer exist.

The proposed pipeline route does not cross any active mining operations. However, three active mining operations have been identified within 1,500 feet of the proposed facilities: a sand/gravel pit located approximately 1,000 feet north of the Cheshire Compressor Station; the Tilcon quarry located between 800 and 1,500 feet northeast of MPs 4.7 to 5.9; and a sand/gravel pit along the Calverton Lateral, 700 feet south of MP CA 3.5.

Islander East contacted appropriate state agencies to identify potential areas of sensitive paleontological resources along the route. Due to the fact the underlying bedrock types are unlikely to contain significant paleontological resources, a discovery is very unlikely. Although reporting is not required, should a discovery occur during construction of the pipeline, Islander East would contact the New York State Geological Survey in New York and, in conjunction with Algonquin in Connecticut, the Connecticut Geological and Natural History Survey in Connecticut (McHone, 2001; Fickies, 2001).

3.1.2.2 Environmental Consequences

The Islander East Pipeline Project would not interfere with the present commercial extraction of mineral resources in the project area, as these operations are located no closer than 700 feet from the proposed right-of-way. The potential for Islander East to limit future exploitation of these resources via expansion of the existing operations is low, because much of the route, including that near the ongoing operations, is located on or adjacent to existing rights-of-way that have already precluded mineral development along the route. Pipeline and aboveground facility construction and operation is expected to have minimal, if any, impact on mineral and paleontological resources.

3.1.3 Geologic Hazards

Geologic hazards that can impact onshore pipeline construction and operation include earthquakes, faults, landslides, soil liquefaction, ground subsidence associated with sinkholes, and underground mines. Of these hazards, earthquakes, faults, and landslides are also potential hazards in the marine environment.

3.1.3.1 Existing Environment

Faults and Earthquakes

Earthquake activity is quite common in many areas of the eastern United States, including New England. The historical record of earthquakes in the northeastern United States and adjacent areas goes back to the 1500s, and a number of seismographs were operating in this region beginning in the early 1900s. Routine reporting of instrumental data on earthquakes in this region began in the late 1930s.

Based on review of geologic maps for the project area, the Islander East Pipeline Project does not cross any mapped faults on Long Island, New York. The proposed pipeline crosses several mapped faults in Connecticut. The Eastern Border Fault is located at MP 6.0 and several other faults are mapped in Connecticut between MPs 2.8 and 6.0. However, none of these faults are considered active, defined as having had movement within the past 11,000 years. Although earthquakes have occurred in Connecticut, they have never been associated with movement along known faults (McHone, 2001).

A search of the U.S. Geological Survey's (USGS) earthquake database found that 161 recorded earthquakes have occurred in the project area since 1534. Of the total, 28 earthquakes had a Modified Mercalli Intensity (MMI) of V or greater with a maximum intensity of VII on two records. Additionally, when searched by earthquake magnitude, with the exception of one recorded event, all earthquakes in the search area were less than a magnitude of 4 on the Richter scale. An explanation of intensities and magnitudes are provided in tables 3.1.3-1 and 3.1.3-2.

TABLE 3.1.3-1
Modified Mercalli Intensity

Value	Abbreviated Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rock noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

TABLE 3.1.3-2
Richter Magnitude

Richter Magnitude	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to approximately 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

To quantify seismic hazards in any given region, the USGS has developed maps of earthquake shaking hazards (USGS, 1997a). Under the National Seismic Hazard Mapping Project, seismic hazard maps were updated in 1996. These maps are used to assess probabilistic seismicity and provide information used to create and update design provisions of building codes in the United States. The codes provide design standards for buildings, bridges, highways, and utilities such as natural gas pipelines. Values on these seismic hazard maps are called peak acceleration values and are expressed as a percentage of gravitational acceleration (acceleration of a falling object due to gravity). The higher the value, the greater the potential hazard.

For the project area in Connecticut and New York, peak acceleration (levels of horizontal shaking) is not expected to be more than 3 percent of gravity, with a 1 in 10 chance of being exceeded in 50 years. This compares to values of 100 percent or more for areas in California. Based on seismic activity studies in California, 10 percent of gravity is the approximate threshold value for damage and generally corresponds to MMIs of VI to VII.

Soil Liquefaction

Soil liquefaction is a phenomenon caused by cyclic shaking of the ground and is typically associated with strong earthquakes. The phenomenon results when increased soil pore pressures approach the ambient external stress. When this condition occurs, the effective stress becomes almost zero, causing the soils to become liquefied. Soil liquefaction can result in surface settlement where the ground surface is flat, or soil flow/slope instability where the ground surface is sloped. The potential for soil liquefaction is greatest in saturated fine to medium-grained sandy sediments in a fairly loose, to medium state of density.

Landslides

The term landslide includes a wide range of slope failures or ground movement, such as deep failure of slopes, shallow debris flows, and rock falls. In general, the risk of slope failures increases as slopes increase and soil particle sizes decrease. Although gravity acting on a naturally or artificially occurring slope is the primary reason for a landslide, there are other contributing factors including: rock and soil slopes weakened through saturation by snowmelt or heavy rains; vibrations from machinery, traffic, blasting, and thunder; excess weight from accumulation of rain or snow, or stockpiling of earthen materials such as rock or ore. In addition, earthquakes can create stresses that make weak slopes fail.

According to the Digital Compilation of "Landslide Overview Map of the Conterminous United States" (USGS, 1997b), the susceptibility to landslides is low for the project area in

Connecticut and high for much of the project area on Long Island. However, the entire project area has a low incidence of landslides and the overall terrain is mostly flat. Potential erosion hazards associated with moraine till deposits consisting primarily of clay and cobble do exist near the coast of the Sound from approximately MPs 32.8 to 34.3. To the south, the proposed Islander East and Calverton Lateral pipeline routes primarily cross sands where the potential for significant erosion is minimal (Fickies, 2001).

Subsidence

Subsidence, as a result of karst terrain or underground mining, is not expected to occur along the pipeline route. Underground mining is not known to occur within the project area and the geologic conditions necessary for karst development, near surface carbonate rock, do not exist.

Marine Environment

Islander East conducted hydrographic, sub-bottom profile, side-scan sonar, magnetometer, and acoustic doppler surveys to characterize the sea floor and underlying shallow stratigraphy along the pipeline corridor across the Sound. Data collected indicate that the sea floor over the vast majority of the proposed route is uniform and slopes gently offshore. No areas of potential hazards were identified along the proposed route.

3.1.3.2 Environmental Consequences

The seismic performance of natural gas pipelines in southern California was reviewed by a team of authors (O'Rourke and Palmer, 1994). The authors found that electric arc-welded pipelines constructed post-World War II that are in good repair have never experienced a break or leak as a result of traveling ground waves or permanent ground deformation during a southern California earthquake. The authors further concluded that modern electric arc-welded gas pipelines in good repair are generally highly resistant to traveling ground wave effects and moderate amounts of permanent deformation.

The potential for ground accelerations with a magnitude greater than 3 percent of gravity is low in the project area. This acceleration rate is a third of the 10 percent of gravity acceleration rate at which earthquakes in California are considered damaging. Thus, we believe that the risk of damage to the Islander East Pipeline Project from seismic ground accelerations is minimal.

Types of sediments susceptible to soil liquefaction are not commonly found along the proposed route. Although soils subject to liquefaction may exist in areas along the pipeline route, there is little potential for liquefaction because the likelihood of a high intensity earthquake is minimal.

Although landslide susceptibility is high for portions of the pipeline route on Long Island, landslide hazards are not anticipated to be significant due to the generally level topography and low incidence of landslides in this area.

Marine Geologic Hazards

Mass movements of sediment can result from pipeline construction. Slumping or sliding of sediments can also result in displacement, rupture, or total destruction of the pipeline. However, mass movements of sediments are usually limited to areas of the continental slope and submarine canyons. Due to the gently sloping nature of the vast majority of the sea floor along each of the proposed optional routes, the risk of causing or being affected by marine landslides is considered negligible.

3.2 SOILS

Islander East and Algonquin (for Connecticut) used NRCS county soil surveys and computerized database products to determine and characterize the soils that would be crossed by the proposed pipeline in Connecticut and New York. The majority of soil interpretations and data presented in tables were developed using the State Soil Geographic (STATSGO) database. STATSGO is a Geographic Information System (GIS) database that groups many combinations of soil series in an association format called a map unit identifier (MUID). It is possible that the same soil series may occur in different MUIDs. Within each MUID, several component soil series are represented. Islander East assumed for the analysis that the frequency of occurrence of each individual component soil series along the pipeline route within each MUID is the same as its percent composition within the MUID. For example, if 10 miles of an MUID are crossed and a soil component series comprises 10 percent of all the total soil component series that make up the MUID, it was assumed that one mile of that soil component series is crossed. The acreage of an individual soil series was obtained by multiplying the percentage of each component soil series in the MUID by the total MUID acreage. The Islander East Pipeline route crosses 8 individual MUIDs collectively comprising 121 individual component soil series in Connecticut and New York.

Islander East identified soil characteristics that could affect or be affected by pipeline construction. The characteristics include highly erodible soils; prime farmland; hydric soils; compaction-prone soils; presence of stones and shallow bedrock; droughty soils; depth of topsoil; and percent slope. The percentage of each MUID within a specific interpretative grouping (e.g., highly erodible soils) was obtained by summing the percentages of all MUID component soil series that were placed in the interpretative group. Total state acreage for each interpretative group was subsequently obtained by summing the individual MUID acreage.

3.2.1 Existing Environment

Soil associations and component soil series (MUIDs) that would be crossed by the Islander East Pipeline Project are listed by milepost in table E-1 in appendix E. The interpretive characteristics of each MUID's component soil series are shown in tables E-2 and E-3. A general description of the soils found along the proposed pipeline right-of-way in Connecticut and New York is provided below.

Connecticut

The Connecticut soils are formed in glacial till or glacial outwash. The Cheshire and Wethersfield soils are well-drained and gently sloping to moderately steep and occur on the till-mantled lowlands. The shallow Holyoke soils occupy uplands where the relief is affected by the underlying bedrock. The Holyoke soils are well-drained to somewhat excessively-drained and have numerous rock outcrops. The glacial outwash in the valleys is dominated by deep, well-drained Hartford and Merrimac soils and excessively-drained Windsor, Manchester, and Hinkley soils. The deep, moderately well-drained, nearly level Berlin and Buxton soils are on lacustrine sediments. The floodplains are dominated by Hadley, Winooski, and Limerick soils.

New York

The majority of the New York soils are formed in glacial outwash and till deposits. Most of the soils are deep and moderately coarse textured to coarse textured. The Riverhead and Haven soils are on remnant beach ridges and outwash plains underlain by sand and gravel deposits. These well-drained soils are on nearly level to sloping sides. The excessively-drained Carver and Plymouth soils also occur on sandy outwash plains, but occupy the steeper areas. The Montauk soils are well-drained to moderately well-drained and are located in the morainic areas dominated by glacial till. The Wareham, Walpole, and Taynham soils are located in the low areas and along drainageways and are somewhat poorly-drained to poorly-drained.

Prime Farmland

The U.S. Department of Agriculture (USDA) defines prime farmland soils as those best suited for production of food, feed, forage, fiber, and oilseed crops. Prime farmland soils generate the highest yields with the smallest expenditures of resources. Prime farmland soils can include either actively cultivated land or land that is currently not cultivated, but is readily available for cultivation. For example, soils currently occupied by pastures, forest, and open land can be classified as prime farmland, but residential areas, commercial/industrial developments, or open water cannot. Some land may be cultivated, but may not be considered prime farmland because its soils may not be best suited for agricultural production.

In Connecticut, 42.2 acres of prime farmland soils would be disturbed by the proposed pipeline and associated aboveground facilities. In addition, 25.8 acres of soils of statewide importance would also be disturbed. No land under the NRCS Conservation Reserve Program has been identified along the proposed pipeline route.

In New York, 117.8 acres of prime farmland soils would be disturbed by the proposed pipeline and associated aboveground facilities. In addition, 104.4 acres of soils of statewide importance would also be disturbed. No land under the NRCS Conservation Reserve Program has been identified along the proposed pipeline route.

Muck Soils

Muck soils are defined by the USDA as soils made up of relatively deep organic deposits, consisting of partly or almost completely decomposed plant material, that have developed in very poorly drained regimes. Muck is made up of 16 to 48 inches of spongy, black or dark-reddish organic material over loose sand and gravel. The amount of partly decayed plants in the organic layer varies. Almost all of the land type is in woodland or marsh grass. These soils have moderate productivity for woodland use and are poorly suited to tree growth. Although occasionally muck soils are cleared and drained and used for vegetable farming, or are filled and are present in community developments, these soils are generally not suitable for engineering purposes. Muck soils are highly compressible, have an almost complete lack of strength, have a potential for flooding or ponding, and are generally poorly suited for cultivated crops because of wetness.

In Connecticut, 8 acres of muck soils would be disturbed by the proposed pipeline and associated aboveground facilities. Nearly all of these soils are in wetlands. No muck soils have been identified along the pipeline route that are used in the production of sod or any other speciality crops.

In New York, 1.8 acres of muck soils would be disturbed by the proposed pipeline and associated aboveground facilities. No muck soils have been identified along the pipeline route that are used in the production of sod or any other speciality crops.

Aboveground Facilities

Soils at the compressor station and meter station sites were identified using NRCS's Soil Survey Geographic (SSURGO) database. The SSURGO database provides more detailed information than the STATSGO database and was designed primarily for farm and ranch, landowner/user, township, county, or parish natural resource planning and management. Soil impacts at the aboveground facilities would be mitigated according to procedures described above.

Cheshire Compressor Station

Algonquin proposes to acquire up to a 61-acre site near the beginning of the AGT Pipelines Retest for the Cheshire Compressor Station. Approximately 8.7 acres of the 61-acre site would be permanently disturbed or fenced. This 8.7 acre area is made up of 7.2 acres within the fenceline and 1.5 acres within the footprint of the compressor station access road. The 7.2 acres within the fenceline of the compressor station is made up of Penwood loamy sands with 0 to 3 percent slopes. The remaining 1.5 acres contain Penwood loamy sands with 3 to 8 percent slopes (approximately 0.7 acre); Manchester gravelly sandy loams with 15 to 45 percent slopes along the northwestern corner of the compressor station site (approximately 0.6 acre); and Belgrade silt loam with 0 to 5 percent slopes near the entrance of the access road (approximately 0.2 acre). Belgrade silt loam is listed as prime farmland and the Penwood soils are listed as farmland of statewide importance. None of the other soils are classified as prime farmland soil. Farmland of statewide importance includes soil units that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to modern farming methods.

The primary limitation of these soils would be droughtiness. Penwood loamy sands are deep and excessively-drained. Permeability is rapid and runoff is slow to medium depending on the slope. Penwood soils have low water capacities and are droughty. Manchester gravelly-sandy loams are deep and excessively-drained. Permeability is rapid in the surface layer and subsoil and very rapid in the substratum. Runoff is slow to high depending on slope. Manchester soils have low water holding capacities and are droughty. Belgrade silt loams are deep and moderately well-drained. Permeability is moderate and ranges from slow to moderately rapid in the substratum. Runoff is slow to medium depending on slope. Belgrade soils have high water holding capacities.

Meter Stations

The soils at the North Haven Meter Station are mapped as Penwood loamy sands, although the area to be affected by operation of the meter station is presently graveled. Soils at the Brookhaven Meter Station are mostly Riverhead sandy loams with a much smaller amount of Plymouth sandy loam. The soils at the AES Calverton Meter Station are listed as cut and fill land. Droughtiness is the primary limitation of these soils. Only the Riverhead soils are listed as prime farmland soil. The Penwood and Plymouth soils are listed as farmland of statewide importance.

Launcher Relocation

The soils at the existing Algonquin launcher facility, located at MP 0.6 of Algonquin's C-1 and C-1 L pipelines, are mapped as Cheshire extremely stony fine sandy loam. However, the area at the site potentially affected is presently graveled.

3.2.2 Environmental Consequences

Pipeline construction activities that have the potential to adversely affect soils are primarily clearing, grading, trenching, and backfilling. Potential effects on soils include erosion due to the action of water and wind, especially on steep slopes and on non-cohesive soils; reduction of soil productivity by mixing topsoil with subsoil or by the introduction of subsurface rock; soil compaction and rutting due to heavy equipment traffic during wet soil conditions; disruption of irrigation systems or surface and subsurface drainage systems; and poor revegetation.

The impact of construction on soils can be effectively reduced through the use of appropriate erosion control and revegetation plans. Islander East and Algonquin modified our standard Plan and Procedures to create its ESC Plan (see appendix D). Islander East and Algonquin would implement the ESC Plan, which would minimize the potential for impacts to soils. Minimizing these potential impacts maximizes the chances of successful revegetation. Islander East and Algonquin have also proposed to contact the state and/or area level offices of the NRCS in Connecticut and New York for review of the ESC Plan.

In addition, erosion and sediment control permits required by the respective states would be filed with the Commission and Islander East and Algonquin would employ environmental inspectors to monitor construction activities and ensure that adverse effects on soils are minimized. Potential impacts to soil resources and specific mitigation measures are discussed below.

Erosion

Erosion is the natural detachment and movement of soils, which leads to loss of soil productivity and changes in composition. Several commentors were concerned about the potential for increased erosion from construction of the proposed pipeline. The erosion potential of soil is determined by several characteristics, including soil texture, surface roughness, vegetative cover, slope length, percent slope, land use, and climate. Water and wind are the primary forces that cause soil erosion. Water erosion occurs primarily on loose, bare soils located on moderate to steep slopes particularly during high intensity storm events when erosive runoff typically occurs. Wind-induced erosion often occurs on dry, fine-textured soils where vegetative cover is sparse and strong winds are prevalent.

For this project, the majority of the highly water-erodible soils are found in Connecticut, while the majority of the highly wind-erodible soils are found in New York. The proposed pipeline right-of-way would cross 41.4 and 16.5 acres of highly water-erodible soils in Connecticut and New York, respectively. The proposed pipeline right-of-way would cross 2.7 and 34.2 acres of highly wind-erodible soils in Connecticut and New York, respectively.

Islander East and Algonquin would minimize erosion of soils by implementing the mitigation measures specified in the ESC Plan. Islander East and Algonquin would install temporary erosion and sediment control measures consisting of sediment barriers, temporary and permanent interceptor dikes, and mulching to minimize the potential for erosion and the movement of sediment on the right-of-way. Temporary sediment barriers would be installed promptly after clearing. These temporary measures would be inspected on a daily basis in areas of active construction, on a weekly basis in non-construction areas, and within 24 hours of each 0.5 inch of rainfall. Ineffective or damaged temporary erosion control structures would be repaired or replaced within 24 hours of identification. Specific mitigation measures proposed by Islander East and Algonquin are discussed below.

Interceptor Dikes/Slope Breakers

Islander East and Algonquin would, during construction, construct temporary interceptor dikes and slope breakers across the full construction right-of-way to slow the velocity of runoff and divert water from the exposed right-of-way. The slowing in velocity would be accomplished by shortening slope lengths along the right-of-way. Reduction of velocity and diversion of runoff helps to prevent soil from entering streams and wetlands. Temporary interceptor dikes would consist of staked straw bales, silt fence, and/or compacted soil, and would be installed across the full construction right-of-way. The drainage outfall from each temporary interceptor dike would be directed to a stable well-vegetated area, or to an energy-dissipating device constructed at the end of the interceptor dike. While the trench is open, temporary interceptor dikes would be maintained only on the working side of the right-of-way until backfilling is completed.

Permanent interceptor dikes would be installed across the full length of the right-of-way during final grading following backfilling, except in agricultural fields and residential areas. Permanent interceptor dikes would be constructed and maintained according to the specifications in the ESC Plan unless further modified by recommendations of the NRCS, Soil and Water Conservation Districts, Land Conservation Department, and/or landowner.

Temporary Sediment Barriers

Islander East and Algonquin would install temporary sediment barriers (i.e., silt fence, staked straw bales, or sand bags) at the base of slopes adjacent to road crossings and at waterbody and wetland crossings. Temporary sediment barriers would be maintained and would not be removed until permanent revegetation measures are successful or until the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

Trench Breakers ("Plugs")

During construction, Islander East would use temporary trench plugs as needed to reduce erosion and sedimentation in the trench, minimize dewatering activities at the base of slopes where sensitive features such as waterbodies and wetlands are often located, and provide access across the right-of-way. Temporary trench plugs would consist of either compacted subsoil placed across the trench (soft plug), or unexcavated portions of the trench (hard plug). Islander East would not use topsoil for construction of temporary trench plugs and would coordinate with landowners to identify suitable locations for the placement of temporary hard trench plugs for access across the right-of-way.

To minimize subsurface water flow and erosion along the trench, permanent trench breakers consisting of sacks of soil, sand, or polystyrene foam, would be installed around the pipe prior to backfilling on slopes greater than 5 percent. An engineer or similarly qualified professional would determine the need for and spacing of trench breakers. Otherwise, trench breakers would be installed at the same spacing as, and upslope of, permanent interceptor dikes. In addition, permanent trench breakers would be installed at the base of slopes adjacent to waterbodies and wetlands.

Right-of-Way Restoration and Final Cleanup

Islander East and Algonquin would attempt to complete final cleanup and installation of permanent erosion control measures in an area within 10 days after backfilling the trench in that area, weather and soil conditions permitting. Restoration of an area would not be delayed beyond the next available seeding season. Overwintering stabilization procedures contained in the ESC Plan would be employed should restoration proceed too late into the dormant season. These procedures include installing interceptor dikes and erosion and sedimentation control devices, temporary mulching of the exposed right-of-way, and seeding soil piles.

Revegetation and Seeding

Islander East and Algonquin would, to the extent practicable, minimize the time that soils are exposed to wind and water by establishment of vegetation on exposed soils as described in the ESC Plan. Upon completion of final grading and cleanup, Islander East and Algonquin would prepare the right-of-way for planting. This would include preparing the seedbed and, with the exception of wetlands, applying and incorporating lime and fertilizer into the top 2 inches of soil. Lime and fertilizer would be added at rates agreed to by the landowner or land management agency, or specified through consultations with the applicable soil conservation authority.

Islander East and Algonquin would seed exposed areas that require revegetation in accordance with written recommendations for seed mixes, rates, and dates obtained from the applicable soil conservation authority or land management agencies, except in upland areas where landowners request alternative seed mixes and in wetlands where Islander East proposes to use annual ryegrass. Islander East would not seed or mulch the right-of-way in cultivated areas, unless otherwise requested in writing by the landowner. As stated in the ESC Plan, Islander East and Algonquin would reseed slopes greater than 30 percent immediately after final grading. Other exposed areas requiring revegetation would be seeded within 6 working days after final grading, weather and soil conditions permitting.

Mulch

Mulch, consisting of straw, erosion-control fabric, or other equivalent, is intended to protect the soil surface from water and wind erosion, and it also optimizes the soil moisture regime necessary for successful revegetation, especially on dry, sandy sites. As specified in the ESC Plan, Islander East and Algonquin would uniformly spread mulch or its functional equivalent over dry, sandy areas and areas with slopes greater than 8 percent to minimize the effects of water and wind erosion and assist with seeding efforts in areas requiring revegetation.

Based upon the soils present throughout the project area and Islander East's and Algonquin's proposed mitigation measures described above, impacts from erosion are not anticipated to be significant. Most of the pipeline and the aboveground facilities would be constructed in generally flat to gently sloping terrain. However, sandy soils and sandy loams with severe erosion potential may be encountered in steeper sloped areas. General slope failure is not anticipated, and trenches would be constructed with side slopes appropriate for the soil conditions encountered, generally at a slope of 1 foot vertical to every 1.5 foot horizontal. This configuration is typically equal to or flatter than the angle of repose of the soils to provide stability of the open trenches and comply with Occupational Safety and Health Administration requirements.

Topsoil Segregation

Several commentors were concerned about potential impacts to topsoil from construction of the proposed pipeline. Islander East and Algonquin would segregate topsoil to minimize adverse effects of pipeline construction on agricultural lands and residential areas. Mixing of soil horizons during construction could adversely affect productivity of agricultural soils and reduce the revegetation success of residential land by diluting the favorable physical and chemical properties of the topsoil with the less productive subsoil. According to STATSGO, the average topsoil thickness along most of the route is 6 inches or less.

During construction, Islander East and Algonquin would segregate topsoil in all residential areas and where the construction right-of-way is wider than 30 feet in annually cultivated or rotated agricultural lands (except pasture), hayfields, and other areas at the landowner's request. As an alternative to topsoil segregation, Islander East may replace (i.e., import) topsoil if approved by the landowner.

Islander East and Algonquin would strip 12 inches of topsoil where it is greater than 1 foot deep, or to the actual depth of topsoil where it is less than 12 inches deep. In areas where topsoil is less than 12 inches deep, it would be stripped to a depth where topsoil color changes to the color of the underlying soil horizon. During construction, topsoil would be stored separately from trench spoil and would not be allowed to mix. Stripped topsoil would be returned to its approximate original position following rough grading of the right-of-way. Topsoil would not be used to pad the pipe or to construct trench plugs.

We believe that Islander East's and Algonquin's proposed topsoil segregation methods are acceptable and would increase the probability of preserving the integrity of topsoil and therefore improving revegetation success.

Compaction Potential and Rutting

Compaction-prone soils are somewhat poorly-drained to very poorly-drained with high moisture content. Factors that influence compaction potential include reduced porosity, infiltration, and aeration, which are also important to root health and plant growth. Soil compaction may also occur in soils with high organic content such as mucky wetland soils or clay soils.

For this project, a small acreage of compaction-prone soils would be affected in Connecticut where the proposed pipeline right-of-way would cross 2.7 acres of these types of soils. Because of the overall sandy composition of the soils in New York, none are considered to be prone to compaction.

Islander East and Algonqiun has modified Section VI.C.1 and eliminated Section VI.C.3 of our Plan that requires compaction testing in agricultural and residential areas disturbed by construction. Islander East's ESC Plan allows for compaction testing and mitigation only in agricultural areas and states that topsoil segregation alone is a sufficient mitigation measure for compaction in residential areas. Islander East and Algonquin would either segregate or replace topsoil in residential areas to provide a suitable medium for grass. Islander East and Algonquin believe that most yards sown in grass do not require deep root penetration, and that subsequent freeze-thaw cycles of the upper portions of the subsoil would provide natural mitigation of any compacted areas within 2 to 3 years. We agree to allow Islander East and Algonquin to perform compaction testing only in agricultural areas. However, we believe that compaction resulting from construction activities must be identified and corrected in both agricultural and residential areas. Therefore, **we recommend that:**

- **For residential areas where Islander East or Algonquin do not test for soil compaction, Islander East and Algonquin should monitor the progress of revegetation annually for 3 years following construction and file a report on the level of revegetation success each year with the Secretary. If revegetation is unsuccessful in a residential area, Islander East and Algonquin should identify in the report the measures they plan to implement to restore the area. If an area continues to be unsuccessfully restored after 3 years, Islander East and Algonquin should file a restoration plan for the area and the landowner's comments on it for the review and written approval of the Director of OEP prior to its use.**

Hydric Soils and Drainage

Hydric soils are defined as soils that are typically saturated, ponded, or frequently flooded for sufficiently long durations during the growing season to develop anaerobic conditions in the upper portion. For this project, hydric soils would be affected in Connecticut, where the proposed pipeline right-of-way would cross 18.7 acres of these types of soils. Because of the overall well-drained nature of the soils in New York, none are considered to be hydric.

Neither Islander East nor Algonquin have identified any agricultural drain tiles along the proposed pipeline routes and aboveground facility locations. Damage to any drain tiles that are identified during construction would be minimized to the extent practicable. Subsurface drain tiles may be cut during trenching and shallow tiles outside of the trench area could be damaged or displaced by heavy equipment, particularly where soil grading or topsoil stripping has reduced the amount of cover over the drain tiles. Disruption of the function of subsurface drainage systems could result in a reduction of crop yields that could extend to areas off the right-of-way.

Islander East would consult with local conservation authorities and/or landowners to determine whether drain tiles are present along the pipeline route. If drain tiles are encountered during construction, Islander East would mark the locations and repair damaged drain tiles to their original condition. Islander East would ensure that the depth of cover over the new pipeline is sufficient to avoid interference with drain tile systems (existing or proposed).

Islander East would undertake measures to minimize the effect of pipeline construction on irrigated lands. Islander East would coordinate with landowners or occupants to minimize disruption of irrigation systems during construction of the pipeline. Islander East would maintain the flow of irrigation water during construction and/or would coordinate any temporary shutoff of irrigation water with affected landowners or tenants. Islander East would repair damaged irrigation systems as soon as possible.

Project construction is not anticipated to have permanent impacts on aboveground drainage patterns because Islander East and Algonquin plan to restore all areas as closely as possible to preconstruction grades. In addition, the majority of soils have a seasonal high water table below the proposed trenching depth. In soils in which the seasonal high water table is at or above the trenching depth, impacts on groundwater levels could occur through dewatering during trench excavation, but would be temporary.

Muck Soils

The vast majority of muck soils found along the pipeline route are found in wetlands and most are located in Connecticut, where the pipeline right-of-way would impact 8 acres of this type of soil. In New York, 1.8 acres of muck soils would be affected.

Because nearly all of the muck soils occur in wetlands, Islander East and Algonquin propose to minimize impacts in these areas by implementing the wetland mitigation measures identified in its ESC Plan which are summarized below. Wetlands are discussed in detail in section 3.7.

Islander East and Algonquin would minimize the impact on these soils by limiting the amount of construction equipment operating in wetlands required to clear the right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the right-of-way.

Islander East and Algonquin would segregate the top 12 inches of topsoil from the ditchline in muck soils, except in areas where standing water or saturated soils are present. Disturbance of muck soils would be minimized by using low ground weight equipment or by supporting equipment on mats or timber riprap where necessary.

Additionally, Islander East and Algonquin would limit the pulling of stumps and grading in wetlands to directly over the trench except where safety dictates stump removal beyond the trenchline. Islander East and Algonquin would restore segregated topsoil to its original position after backfilling is complete. During restoration, Islander East and Algonquin would remove temporary soil stabilization measures and would restore original wetland contours and flow regimes. Islander East and Algonquin would also install trench plugs and/or seal the bottom of the trench as necessary to maintain the original wetland hydrology at locations where the trench may drain a wetland.

Islander East and Algonquin have not identified any muck soils that are used for sod or any other specialty crops along the pipeline route. Islander East and Algonquin would monitor wetlands annually for the first 3 to 5 years after construction to determine the success of revegetation (see section 3.7, Wetlands). Islander East and Algonquin would develop and implement additional restoration measures in these areas if monitoring indicates that additional restoration is necessary.

We believe that by implementing these mitigation measures, impacts to muck soils would be minimized to the extent possible and would primarily be short-term in nature.

Stony/Rocky Soils and Shallow-to-Bedrock Soils

Grading, trenching, and backfilling could bring rocks to the soil surface that could interfere with tilling, planting and harvesting, or result in damage to agricultural equipment. Ripping and blasting of shallow bedrock during construction could result in the incorporation of bedrock fragments into topsoil. STATSGO information indicates that shallow-to-bedrock soils and stony soils are limited to the Connecticut portion of the pipeline route. However, the information retrieved from the STATSGO database does not indicate the relative hardness or composition of the subsurface bedrock.

Relative acreages of soil associations that have stony or rocky soils are listed by milepost in table E-1 of appendix E. The introduction of subsoil rocks or stones into agricultural topsoils wo... be minimized by segregating topsoil from trench spoil and delaying replacement of segrega... topsoil in agricultural areas until after cleanup. Islander East would remove excess rock from at least the top 12 inches of soil to the extent practical in rotated and permanent cropland, hayfields, pastures, residential areas, and other areas at the landowner's request. The objective of these removal efforts would be to achieve a similar size, density, and distribution of rock on the construction right-of-way with the adjacent areas not disturbed by construction.

Algonquin does not anticipate the need for any blasting. If blasting is required, by Islander East, it would use blast charge timing and also use the minimum explosive charge necessary to fracture bedrock and keep shot-rock from leaving the construction right-of-way. Excess blast rock would be hauled off the right-of-way or, subject to landowner approval and applicable permit conditions, windrowed along the edge of the right-of-way. Blasting is discussed in detail in section 3.1.

We believe that Islander East's proposed efforts to limit the introduction of subsoil rocks or stones into topsoil are adequate and should aid in promoting successful revegetation.

Aboveground Facilities

The majority of soil impacts associated with aboveground facilities would be associated with construction of the Cheshire Compressor Station and meter stations. Construction at the sites of the proposed valves would impact soils to a lesser degree because they are within the right-of-way and immediately adjacent to the pipeline's trenchline.

<u>Cheshire Compressor Station</u>

Approximately 7.9 acres of soils considered as farmland of statewide importance would be directly impacted by construction of the new compressor station and lost as potential farmland.

<u>Meter Stations</u>

A total of approximately 2.3 acres of soil would be impacted by construction at the existing North Haven Meter Station and by construction of the Brookhaven and the AES Calverton Meter Stations. Excluding the soils at the existing North Haven Meter Station, the new meter stations would permanently impact approximately 1.1 acres of prime farmland soil and approximately 0.1 acre of soil of statewide importance. These soils would be permanently lost as potential farmland; however, due to the small acreage involved, their potential use as farmland would be limited.

<u>Launcher Relocation</u>

Algonquin would remove two launchers from an existing mainline valve and interconnect facility at MP 0.6 on Algonquin's C-1 and C-1 L pipelines. The launchers would be relocated to the Cheshire Compressor Station. A total of approximately 0.5 acre would be disturbed by the removal of the launchers. The soils at the existing facility are mapped as Cheshire extremely stony fine-sandy loam, although the area at the site is presently graveled. After the launchers are removed, disturbed areas would be graveled similar to the surrounding area, and the existing mainline val... and interconnect would continue to operate at the site. There would be no effect on soils at t... existing facility due to the current presence of gravel at the site.

Flash Flooding

Flash flooding is not expected to be a concern in the project area. Flash flooding is possible in smaller streams and tributaries after a significant rainfall event. None of the major aboveground facilities are in areas that would be prone to flash flooding. The buried depth, pipe wall thickness, and concrete coating of the pipeline within the streambed and the implementation of Islander East's ESC Plan would minimize the potential for pipe exposure if major flooding occurs.

3.3 WATER RESOURCES

3.3.1 Groundwater

Groundwater use, quality, and availability vary throughout the project area. In Connecticut and New York, approximately one-third of the population relies on groundwater as its source of drinking water. In most of the project area, natural groundwater is suitable for drinking as well as other purposes, but the quality of the water differs among aquifers as a result of natural occurring conditions and local human activity (USGS, 1995).

3.3.1.1 Existing Environment

Groundwater Quality and Quantity

Connecticut

In Connecticut, groundwater accounts for approximately 33 percent of water supplied to rural, domestic, and small-community water systems. The surficial aquifer system, composed of coarse-grained, stratified outwash and coarse to fined-grained ice-contact deposits, is the most widely used and productive aquifer in Connecticut. These surficial deposits range in thickness from 150 to 400 feet in the project area, with the deepest segment in valley-filled areas. In glacial outwash deposits, well depths typically range from 10 feet to 120 feet, but may exceed 150 feet in depth. Well yields in coarse-grained ice-contact deposits typically range between 10 gallons per minute (gpm) to 1,000 gpm and can exceed 3,000 gpm in some areas. Where this aquifer consists primarily of unstratified, fine-grained deposits, well yields are reduced and typically range from 10 gpm to 400 gpm, but may exceed 2,000 gpm in some areas (USGS, 1995).

Outwash and ice-contact deposits yield water that is generally of good quality and adequate for most uses. Due to the high permeability of ice-contact deposits, shallow wells in these surficial deposits are susceptible to contamination from land treatments.

The bedrock aquifer, which lies beneath the surficial deposits, consists predominately of deep sandstone, shale, and conglomerates. Water in this aquifer is unconfined to partly confined in the uppermost 200 feet, and yields are primarily restricted to bedding planes, fractures, joints, and faults. Well depths range from 100 feet to 300 feet, and yields from the sandstone aquifer are related to well diameter, well depth, and the use of the water. Yields of small-diameter, shallow, domestic wells in bedrock aquifers commonly range from 2 gpm to 50 gpm, but yields of large-diameter, deep, industrial wells may exceed 600 gpm (USGS, 1995).

Water quality in the sandstone aquifer is suitable as drinking water and most other uses, but is locally hard to excessively hard. High chloride, calcium, and sulfate concentrations are present, and originate from the dissolution of gypsum that is naturally present in the sandstone. High chloride concentrations may indicate local contamination from road-deicing chemicals or may be generated from naturally occurring chloride compounds (USGS, 1995).

New York

In New York, the project area lies within the Northern Atlantic Coastal Plain aquifer system, a hydrogeologic unit consisting of coarse and fine-grained unconsolidated sediments. The pipeline route crosses three distinct groundwater formations within the system: the Upper Glacial, the Magothy, and the Lloyd aquifers. These formations are unconsolidated, surficial aquifers overlying crystalline metamorphic and igneous bedrock. The thickness of the unconsolidated material ranges from several hundred feet in the eastern section of Long Island to 2,000 feet in south central Suffolk County.

The Upper Glacial aquifer, which underlies all of the project area, has a thickness ranging from 200 feet to 700 feet. This aquifer system is predominately glacial outwash, composed of stratified fine to coarse sand and gravel and contains large quantities of groundwater. This aquifer is the principal source of public drinking water in eastern and central Suffolk County. The formation has a high permeability and can produce well yields in excess of 1,000 gpm without negatively affecting the surrounding water table elevation.

Groundwater quality within the Upper Glacial Aquifer varies widely, reflecting the nature and extent of local development. General groundwater quality is good, but localized areas of contamination have been recorded. In undeveloped areas, groundwater contains low nutrient concentrations and undetectable levels of contaminants. In areas adjacent to industries, near small commercial establishments, and in proximity to industrial facilities, significant localized contamination of groundwater has occurred. The most common contaminants are derived from petroleum products and organic solvents. In agricultural areas, the nitrate-nitrogen concentration in groundwater has exceeded the drinking water standard (U.S. Environmental Protection Agency [USEPA], 2001a).

The Magothy Formation is composed of river delta sediments that were deposited over the Raritan Formation. This formation consists of highly permeable quartzose sand and gravel deposits with interbeds and lenses of clay and silt. The Magothy formation is the main source of water for public supply in western Suffolk County, and is generally unconfined. The thickness of the aquifer generally increases from the north to the south, and ranges from 0 feet to 1,100 feet. Well yields from this aquifer range between 50 gpm to 1,200 gpm, but can exceed 2,000 gpm.

Groundwater obtained from the Magothy Aquifer is considered good, but sanitary sewage and lawn chemical leaching can impact groundwater quality in residential areas. Some shallow, private wells have concentrations of nitrate-nitrogen that exceed drinking water standards. Overall, however, residential development has not caused significant degradation of the public water supply as public supply wells have continued to provide water of excellent quality (USEPA, 2001a).

The Lloyd Aquifer lies immediately above solid bedrock, is approximately 0 feet to 550 feet thick, and lies 200 feet to 1,800 feet beneath the ground surface. This aquifer is the main source of drinking water on the northwestern shore of Long Island. The Lloyd Aquifer consists of fine to coarse sand and gravel with a clayey matrix, and produces yields of 50 gpm to 1,000 gpm.

Due to the depth of the Lloyd Aquifer, groundwater obtained from this formation is of excellent quality. Contamination is absent and concentrations of dissolved solids are exceptionally low (USEPA, 2001a).

Federal and State Designated Aquifers

Islander East contacted the U.S. EPA and state and local agencies regarding the presence of designated aquifers within the project area. Table 3.3.1-1 identifies the Federal and state designated aquifers in the project area.

TABLE 3.3.1-1
Federal and State Designated Aquifers Along the Islander East Pipeline Project

Facility Name or MP Location	Crossing Length	Designation	Aquifer Name
CONNECTICUT – Algonquin Facilities			
Cheshire Compressor Station	N/A	State Designated	North Cheshire Wellfield Aquifer Protection Area
CONNECTICUT – Islander East Pipeline			
Connecticut – None Crossed	N/A	N/A	N/A
NEW YORK – Islander East Pipeline			
New York – MP 32.9 – 44.0 a/	11.1 Miles	EPA Designated	Nassau-Suffolk Sole-Source Aquifer
New York – MP 34.4 – 42.7 a/	8.3 Miles	State Designated	Central Pine Barrens Special Groundwater Protection Area
NEW YORK – Calverton Lateral			
New York – MP CA 0.0 – CA 5.6 b/	5.6 Miles	EPA Designated	Nassau-Suffolk Sole-Source Aquifer
New York – MP CA 0.7 – CA 5.6 b/	4.9 Miles	State Designated	Central Pine Barrens Special Groundwater Protection Area

a/ Islander East Pipeline milepost.
b/ Calverton Lateral milepost.
N/A Not Applicable

Connecticut

The Cheshire Compressor Station would be located within the boundary of the state-designated North Cheshire Aquifer Protection Area. The CTDEP establishes aquifer protection areas around public water supply wells that are placed in stratified drift and serve more than 1,000 people (CTDEP, 2001a). The North Cheshire Wellfield consists of six wells clustered approximately 5,000 feet south/southeast of the proposed compressor station site. These wells tap the surficial aquifer system and range from 96 to 110 feet in depth.

New York

In New York, the entire project area is underlain by the EPA designated Nassau-Suffolk sole-source aquifer (USEPA, 2001a). Within the Nassau-Suffolk sole-source aquifer, New York has designated nine areas as special groundwater protection areas. The purpose of the special groundwater protection area designation is, in part, to assure that areas within designated sole-source aquifer areas are protected and managed in such a way as to maintain or improve existing water quality (New York State Consolidated Laws [NYSCL], 2001). The special groundwater protection area within the project area corresponds to the boundary of the Central Pine Barrens and is located between MPs 34.4 and 42.7, and MPs 42.8 and 43.3. Thus, 8.8 miles of the proposed pipeline would be located in this special groundwater protection area.

Public Water Supply Wells

Connecticut

Islander East and Algonquin contacted the CTDEP, Bureau of Water Management and the South Central Connecticut Regional Water Authority (SCCRWA) to obtain information on public water supply wells near the project area. Based on results of these consultations, no community water supply wells are located within 400 feet of the proposed facilities in Connecticut (CTDEP, 2001a; SCCRWA, 2001).

New York

Islander East contacted the local water authorities in New York for information on public water supply wells in the vicinity of the proposed facilities. Based on these consultations, the nearest public water supply well is located along the west side of the William Floyd Parkway, approximately 250 feet west of the construction right-of-way. The William Floyd Parkway Wellfield is located approximately at MP 40.9 and consists of three wells (Bova, 2001). Wells No. 1 and 2 are completed in the glacial aquifer and are 165 feet and 179 feet deep, respectively. Well No. 3 is completed within the Magothy formation at a depth of 269 feet. There is currently no wellhead protection program in place for this wellfield (Colabufo, 2001). No other community water supply wells have been identified within 400 feet of the proposed facilities in New York (Suffolk County Department of Health Services [SCDHS], 2001).

Private Water Supply Wells

The majority of the residents in the project area are serviced by municipal water systems. However, private wells are also used, particularly in the more rural areas crossed by the project. Islander East is in the process of identifying private water supply wells in the project area within 150 feet of the construction right-of-way. Water supply wells, their locations, and approximate distance and direction from construction zones will be identified in the Final EIS.

Contaminated Groundwater

Islander East completed a search of Federal and state databases to identify contaminated sites that could be encountered during construction. The following databases were reviewed: EPA National Priority List, EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list, state equivalent priority list, state equivalent CERCLIS list, leaking underground storage tanks, emergency response notification system of spills, and state spills list. Based on the results of this query, no known contaminated sites would be crossed by the project. However, within 0.25 mile of the pipeline route, 21 potential sources of groundwater and soil contamination were identified. Table 3.3.1-2 lists the pipeline facilities, approximate milepost, name and type of the sites, and the distance from the pipeline right-of-way to known or suspected contaminated sites.

One commentor was specifically concerned about potential impacts from construction on contaminated groundwater migration from the contaminated site located near MP 5.5, the Hartt Property. Islander East has stated it will submit available site-specific background data concerning depth to bedrock and groundwater, and the extent of the contaminated groundwater plume in this area by the end of March 2002. This data is necessary to determine the potential impacts of construction on contaminated groundwater migration. We will review this data and our analysis will be included in the Final EIS.

TABLE 3.3.1-2

Contaminated Sites and Landfills Located Within 0.25 Mile of the Islander East Pipeline Project

Facility	Approx. MP	Type of Site	Name of Site	Distance and Orientation from Project
ALGONQUIN FACILITIES				
Cheshire Compressor Station				
Connecticut	0.6	SCL	Kuehl Line Marking, Inc.	0.1 mile southeast
	0.6	SCL / CERCLIS	Alling Lander Company	0.2 mile east
	0.6	SWLF	A.J. Waste Systems	0.3 mile southeast
ISLANDER EAST FACILITIES				
Islander East Pipeline				
Connecticut	4.0	SCL	CT Auto Lift	0.3 mile west
	5.5	CERCLIS	Hartt Property	0.1 mile northeast
	6.2	SCL	Jason's Coin Laundry Dry Cleaners	0.1 mile east
	6.8	SCL	White Eagle Limited	0.1 mile east
	7.5	CERCLIS	Echlin Manufacturing	0.1 mile east
	7.5	SCL	Sandvik Milford, Corp.	Adjacent to the west
	7.8	SCL / CERCLIS	East Main St. Disposal Area	0.1 mile west
New York	38.0	LUST	Amoco Oil	0.3 mile west
	38.5 to 41.7	NPL / SPL / SWLF	BNL	Adjacent to the east
	44.7	LUST	Texaco	0.2 mile north
	44.7	SWLF	Oyster Bay LFGR	0.2 mile north
Calverton Lateral (New York)	3.4	LUST	Metro S/S	Adjacent
	5.0 to 5.5	CERCLIS	Naval Weapons Industrial Reserve	Adjacent to the east and south
	5.0 to 5.5	CERCLIS	Grumman Aerospace	Adjacent to the east and south
	5.0 to 5.5	LUST	Grumman Calverton Fuel Area	Adjacent to the east and south
	5.0 to 5.5	LUST	Grumman Aerospace, Corp.	Adjacent to the east and south
	5.0 to 5.5	LUST	Grumman Swan Pond Road	Adjacent to the east and south
	5.0 to 5.5	LUST	NWIRP Calverton	Adjacent to the east and south

Notes: BNL – Brookhaven National Laboratory
CERCLIS – Comprehensive Environmental Response, Compensation and Liability Information System (U.S. EPA)
LUST – Leaking Underground Storage Tanks (States of Connecticut and New York)
NPL – National Priority List (U.S. EPA)
SCL – State Equivalent CERCLIS List (States of Connecticut and New York)
SPL – State Equivalent Priority List (States of Connecticut and New York)
SWLF – Solid Waste Landfills, Incinerators, or Transfer Stations (States of Connecticut and New York)

3.3.1.2 Environmental Consequences

Although construction activities associated with proposed pipeline installation could affect groundwater resources, potential impacts would be avoided or minimized by the use of both standard and specialized construction techniques. Islander East would implement measures in its ESC Plan, which combines our Plan and Procedures, that would minimize impact to potable water sources. The potential impacts to both shallow and deep groundwater resources from pipeline construction and operation, and Islander East's proposed mitigation measures, are discussed below. This subsection is divided into the following topics: General Construction Procedures; Contamination of Groundwater; and Damage to Infrastructure.

General Construction Procedures

Construction, operation, and maintenance of the Algonquin and Islander East Pipeline Project is not expected to have an impact on deep groundwater resources, due to the nature of the construction activities and the types of aquifers in the project area. Ground disturbance associated with typical pipeline construction is primarily limited to 10 feet below the existing ground surface, which is well above deep aquifers. Thus, no impact to deep aquifers would be expected from pipeline construction.

Construction activities such as trenching, dewatering, blasting, and backfilling may encounter shallow groundwater and potentially could cause minor fluctuations in shallow groundwater levels and/or increased turbidity within the "top" of an aquifer. Islander East identified areas where the water table may be encountered within 6 feet of the ground surface using the NRCS SSURGO soil database. These soils are listed in appendix E, Soil Characteristics of the Proposed Route. These areas typically exhibit relatively rapid recharge and groundwater movement. The effects of construction would be short-term, the aquifer would be expected to quickly re-establish equilibrium, and turbidity levels would not be expected to remain elevated in the long term. Furthermore, as shown in table E-2, the majority of soils that would be crossed in both Connecticut and New York have water tables greater than 6 feet deep. Thus, minimal if any disruption to the groundwater table would be expected in these areas.

In areas of shallow groundwater, dewatering of the pipeline trench and well point dewatering for bore pits would be the only potential activity requiring pumping of groundwater. The potential effect of groundwater withdrawal on users of the aquifer would depend on the rate and duration of pumping. However, most wells typically pull water from deeper groundwater sources that would be less affected by temporary shallow groundwater fluctuations. Pipeline construction activities within a particular location are typically completed within several days; consequently, potential impacts are temporary. Dewatering impacts can be minimized by discharging all water into well-vegetated upland areas or properly constructed dewatering structures, which would allow the water to return to the shallow aquifer. No silt-laden water should be allowed to directly enter any waterbody or wetland.

In addition, shallow aquifers could experience minor temporary disturbance from changes in overland water flow and recharge caused by clearing and grading of the right-of-way. In vegetated areas, enhanced water filtration provided by a well-vegetated cover would be temporarily lost until vegetation can be successfully reestablished. Near-surface soil compaction caused by heavy construction vehicles could also reduce the soils' ability to absorb water. However, the acreage affected is small in comparison to the aquifer's recharge area; impacts from surface soil compaction would be minor and temporary, and would not significantly affect groundwater resources or groundwater quality.

Several commentors were concerned about the project's impact on groundwater quality in general. For the reasons discussed above, we believe that any effects to groundwater quality from construction of the pipeline would be minor and temporary in nature and would not adversely affect groundwater quality in the long term.

Alteration of the natural soils strata could result in new migration pathways for groundwater, particularly in wetland areas. Several commentors from North Haven, Connecticut claim that previous construction of Algonquin's pipelines have caused problems with groundwater flow. Algonquin and Islander East's ESC Plan requires the installation of trench breakers to slow the preferential movement of groudwater along the trench. Trench breakers are barriers installed in the trench, consisting of sandbags or polyurethane foam. In addition, Algonquin and Islander East's ESC Plan dictates that every attempt would be made to return soil materials to their appropriate depth, thus minimizing alteration of groundwater flow regimes. We believe that strict adherence to the ESC Plan would ensure minimal alteration of groundwater flow regimes.

Contamination of Groundwater

The Suffolk County Water Authority has expressed concern with the potential for contamination impacting public water supply wells. The main potential for contamination of groundwater from the proposed pipeline project is refueling of vehicles and storage of fuel, oil, and other fluids during the construction phase. These activities could create a potential long-term contamination hazard to aquifers. Spills or leaks of hazardous liquids could contaminate groundwater and affect users of the aquifer. Soil contamination could continue to add pollutants to the groundwater long after the spill has occurred. This type of impact could be avoided or minimized by restricting the location of refueling and storage facilities and by requiring immediate cleanup in the event of a spill or leak. Islander East and Algonquin would prohibit refueling activities and storage of hazardous material within 200 feet of all private wells and within 400 feet of all public water supply wells. Islander East and Algonquin would not store hazardous materials, fuels, lubricating oils, or perform concrete coating activities within any municipal watershed area unless approved by the appropriate government authority. We believe that strict adherence to these procedures would provide adequate protection to both public and private water supply wells.

Islander East and Algonquin submitted a general SPCC Plan for inland spills detailing measures that would be taken to cleanup and dispose of any accidental discharge within a municipal watershed, or within 100 feet of wetlands or waterbodies. This SPCC Plan is contained within its ESC Plan (see appendix D). We have reviewed this SPCC Plan and believe that it contains the essential elements of a general SPCC Plan.

In addition, the SPCC Plan that Islander East and Algonquin have submitted would be customized for each spread, in consultation with its construction contractor after a construction contractor has been selected, to address specific preventative and mitigative measures that would be used to minimize the potential impact of a hazardous waste spill. These SPCC Plans would include refueling restrictions; designation of storage, refueling, staging, and lubrication location prior to construction; identification of specific state and local authorities to notify in the event of a spill and notification procedures; and cleanup and disposal actions. These SPCC Plans would be filed with the Secretary for our review and written approval prior to construction.

A comment letter expressed concern that gas from the proposed pipeline could leak and infiltrate local underground water supplies, causing contamination. Methane is the primary component of natural gas and is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. It is not very soluble in water and at atmospheric temperatures is less dense than air. For these reasons, contamination of groundwater by methane would be highly unlikely, if not impossible. Should a leak or venting of gas occur, the methane would escape into the atmosphere and readily disperse, and not seep into the ground.

Damage to Infrastructure

Construction of natural gas pipelines has the potential to damage subsurface infrastructure such as wells, septic fields, and agricultural drain tiles (discussed in section 3.2, Soils). In order to mitigate any problems that may occur to wells in the project area, Islander East and Algonquin propose, with the well owners permission, to conduct pre- and post-construction testing for public and private water supply wells within 400 feet and 150 feet of construction work areas, respectively. Islander East has offered to repair or replace any well that is impacted by construction of the Islander East Pipeline. Islander East, however, has yet not identified private water supply wells located within 150 feet of construction work areas. Therefore, **we recommend that:**

- **Before construction, Islander East and Algonquin should file with the Secretary the location by milepost of all private wells within 150 feet of pipeline construction activities. The proposed pre- and post-construction monitoring should include well yield and water quality for both private and public wells. Water quality testing should be conducted using testing criteria for new water wells in each state as dictated by each state's Department of Health. Within 30 days of placing the facilities in service, Islander East and Algonquin should file a report with the Secretary discussing whether any complaints were received concerning well yield or water quality and how each was resolved. In addition, Islander East and Algonquin should file a report with the Secretary identifying all potable water supply systems damaged by construction and how they were repaired.**

3.3.2 Surface Water

3.3.2.1 Existing Environment

Watershed Descriptions

The Islander East Pipeline Project would cross the Quinnipiac Watershed in Connecticut, and the Northern and Southern Long Island Watersheds in New York (USEPA, 2001b). Table 3.3.2-1 lists the watershed, milepost location, drainage area, and watershed characterization of the watersheds that would be crossed. Long Island Sound is discussed in section 3.3.3.

Waterbody Classifications

The proposed project would cross 10 perennial waterbodies, 4 intermittent waterbodies, and the Sound. Of the 14 crossings, 12 are in Connecticut and 2 are in New York. No perennial or intermittent waterbodies would be crossed by the Calverton Lateral. A description of the Sound is included in section 3.3.3.

TABLE 3.3.2-1
Watersheds Crossed by the Islander East Pipeline Project

State/Watershed	Milepost Location	Drainage Area (mi^2)	Watershed Characterization
CONNECTICUT – Algonquin Facilities and Islander East Pipeline			
Quinnipiac	0.0 – 13.7 a/ 0.0 – 10.2 b/	558.2	The Quinnipiac Watershed is characterized as having more serious water quality problems, with aquatic conditions well below State or Tribal water quality goals. However, data suggest that pollutants or other stressors are low, which would indicate a low potential for future declines in aquatic conditions.
NEW YORK – Islander East Pipeline			
Northern Long Island Sound	32.8 – 34.0 b/	912.2	The designated uses of surface waters within the Northern Long Island Watershed are largely met with few water quality problems. However, due to the presence of pollutants and other stressors, there is vulnerability for a decline in the aquatic conditions within the watershed.
NEW YORK – Islander East Pipeline and Calverton Lateral			
Southern Long Island Sound	34.0 – 44.8 b/ CA 0.0 – CA 5.5 c/	1,961.3	The Southern Long Island Watershed is characterized as having less serious water quality problems. However, the presence of pollutants or other stressors indicate that the watershed may be susceptible to declining aquatic conditions.

a/ Algonquin C-1 and C-1 L Pipelines milepost.
b/ Islander East Pipeline milepost.
c/ Calverton Lateral milepost.

Table 3.3.2-2 lists the location, waterbody name, flow regime, width, surface water and fishery classification, and the proposed crossing method of the waterbody crossings in Connecticut and New York. A description of the existing fishery resource is provided in section 3.4.1.

Sensitive Waterbodies

With the exception of the Peconic River (MP 38.5), all of the waterbodies crossed by the proposed project are classified as coldwater streams (CTDEP, 2001b; NYSDEC, 2001). The Peconic River and Carmans River (MP 43.2) are designated as state scenic rivers (see section 3.8.5, Visual Resources). In addition to being classified as a trout stream, the Farm River is also located within a water supply watershed. Two of the Connecticut waterbodies, the Farm River (MP 3.3) and Stony Creek (MPs 8.8 and 8.9), are also identified as supporting anadromous fisheries. Coastal rivers that support anadromous species are important aquatic resources from both a freshwater and saltwater perspective since these species reside in both environments at different times of the year or lifestages (see section 3.4.1 for a detailed discussion of these streams).

Water Supply Watersheds

Two water supply watersheds are located within the project area: the Broad Brook Reservoir and the Farm River Diversion (CTDEP, 2001a; SCCRWA, 2001). Both of the water supply watersheds are in Connecticut; no water supply watersheds would be crossed in New York.

The existing Algonquin pipelines in Cheshire, Connecticut cross the Broad Brook Reservoir Watershed. The segment of the Algonquin Pipeline that would be inspected for anomalies is located within the Broad Brook Reservoir Watershed between MPs 3.7 and 3.8 of the Algonquin C-1 and C-1L pipelines. The Broad Brook Reservoir, located 500 feet east of the Algonquin pipeline, is one of 12 sources that supply water to Meriden, Connecticut. The Farm River Diversion Watershed would be crossed by the Islander East pipeline between MPs 2.5 and 5.2. The Farm River (MP 3.3) supplies water to Lake Saltonstall through an aqueduct located on the north side of the lake. Lake

Saltonstall is located 2.0 miles southeast of the pipeline route. The Lake Saltonstall Water Treatment Plant, operated by the SCCRWA, is located on the south side of the lake. No known water supply intakes are located within 3 miles downstream of the Farm River crossing location (Maloon, 2001).

TABLE 3.3.2-2

Waterbodies Crossed by the Islander East Pipeline Project

MP	Waterbody Name	Flow [a]	Approx. Width (feet)	Surface Water Quality Classification [b]	Fishery Classification [c]	Proposed Crossing Method
CONNECTICUT – Algonquin Facilities						
No waterbodies are within the areas to be disturbed by Algonquin facilities						
CONNECTICUT – Islander East Pipeline						
0.5	Muddy River	P	15	B/A	CWF	Flume
1.8	Five Mile Brook	P	10	A	CWF	Flume
2.7	Tributary to Farm River	I	<10	A	CWF	Flume
3.1	Tributary to Farm River	I	<10	A	CWF	Flume
3.2	Tributary to Farm River	I	<10	A	CWF	Flume
3.3	Farm River	P	15	A	CWF/ANA	Flume
4.1	Burrs Brook	P	10	A	CWF	Flume
4.6	Burrs Brook	P	10	A	CWF	Flume
4.8	Burrs Brook	P	10	A	CWF	Flume
7.7	Branford River	P	15	B/A	CWF	Flume
8.8	Stony Creek	P	<10	A	CWF/ANA	Flume
8.9	Stony Creek	P	<10	A	CWF/ANA	Flume
Long Island Sound (MPs 10.2 – 32.9; see section 3.3.3)						
NEW YORK – Islander East Pipeline						
38.5	Peconic River	I	15	C	WWF	Wet Trench
43.2	Carmans River	P	20	C (TS)	CWF	HDD
NEW YORK – Calverton Lateral						
No waterbodies are disturbed by the Calverton Lateral.						

a/ P = Perennial
I = Intermittent – intermittent streams, if dry at the time of crossing, may be open cut.

b/ Water Quality Classifications
Connecticut
Class A = Known or presumed to meet water quality criteria that support potential drinking water supply; fish and wildlife habitat; recreational use; agricultural and industrial supply and other legitimate uses including navigation.
Class B/A = May not meet water quality criteria or one or more designated uses. The water quality goal is achievement of Class A criteria and attainment of Class A designated uses.
New York
Class C = waters that are suitable for secondary contact recreation.
(TS) = waters that support trout spawning.

c/ CWF = Coldwater Fishery
WWF = Warmwater Fishery
ANA = Anadromous Fishery

Contaminated Sediments

Islander East contacted state agencies in Connecticut and New York and reviewed existing published information (e.g., fish consumption advisories, Section 305(b) and 303(d) water quality reports) for information on the presence of contaminated sediments in the vicinity of the proposed waterbodies' crossings. Based on these contacts, none of the crossing locations are suspected of having contaminated sediments (Guthrie, 2001; Pizzuto, 2001).

3.3.2.2 Environmental Consequences

Pipeline construction could affect surface waters in a variety of ways. This subsection is divided into the following topics: General Construction Procedures; Contamination of Surface Water; Directional Drill; and Hydrostatic Test Water.

General Construction Procedures

Some potential impacts from general construction procedures such as clearing and grading of stream banks, blasting, in-stream trenching, trench dewatering, and backfilling could include the modification of aquatic habitat, increased sedimentation, increased turbidity, decreased dissolved oxygen concentration, increased water temperature, releases of chemical and nutrient pollutants from sediments, and introduction of chemical contamination, such as fuel and lubricants.

The greatest potential impacts on surface waters would result from suspension of sediments caused by in-stream construction and by erosion of cleared stream banks and adjacent right-of-way. The extent of the impact would depend on sediment loads, stream velocity, turbulence, stream bank composition, and sediment particle size. These factors would determine the density and downstream extent of the turbid plume of sediment. Turbidity resulting from suspension of sediments due to in-stream construction or erosion of cleared right-of-way areas could reduce light penetration and the corresponding photosynthetic oxygen production. Resuspension of deposited organic material and inorganic sediments could cause an increase in biological and chemical intake of oxygen, also resulting in a decrease of dissolved oxygen.

Grading of stream banks could expose soil to erosional forces and could reduce riparian vegetation along the cleared section of the stream. The use of heavy equipment for construction could cause compaction of near-surface soils, an effect that could result in increased runoff into waterbodies. The increased runoff could erode stream banks, resulting in increasing turbidity levels and sedimentation rates of the receiving waterbody. In order to minimize the amount of disturbance to stream buffer areas before the actual stream crossing, Islander East has proposed leaving an ungraded 10-foot vegetative strip adjacent to the high water bank and that clearing and grading operations may proceed through this strip only on the working side of the right-of-way in order to install the equipment bridge and travel lane. We believe that this 10-foot buffer strip should adequately protect from increased runoff into the waterbody, thus minimizing adverse impacts to the waterbody.

Islander East proposed one deviation from our Procedures in its ESC Plan. Section V.B.4.a of our Procedures specifies that for all intermediate waterbody (greater than 10, but less than or equal to 100 feet wide) crossings, spoil shall be placed at least 10 feet from the water's edge. Islander East has proposed that spoil may be sidecast into intermediate waterbodies greater than 30 feet in width. However, as shown on table 3.3.2-2, no waterbodies greater than 20 feet are proposed to be crossed, except the Sound. Therefore, we see no reason to approve a variance for conditions that would not be encountered. If conditions change such that Islander East requires a deviation, approval can be requested on a site-specific basis.

Contamination of Surface Water

Refueling of vehicles and storage of fuel, oil, or other fluids near surface waters may create a potential for contamination due to accidental release. If a spill were to occur, immediate downstream users of the water would experience a degradation in water quality. Acute and chronic toxic effects on aquatic organisms could result from such a spill. Similar adverse effects on water quality could result from the resuspension of pollutants from previously contaminated sediments during in-stream excavation activities, although no areas of known contamination are present at the proposed crossing locations. The amount of contamination released from resuspended sediments would depend on the existing concentration and on the sorptive capacity of the surrounding sediments. The potential for spills would be reduced by implementation of Islander East's SPCC Plan. Within the SPCC Plan, Islander East specifies that fueling of equipment and storage of fuel would occur at least 100 feet away from waterbodies.

Many commentors are concerned with the potential for construction of the proposed pipeline to impact public water supplies in Connecticut. Islander East has stated that it would continue to consult with the City of Meriden Water Division and the SCCRWA regarding potential impacts on water supplies in Connecticut and the need for specific mitigation measures. We believe that strict implementation of the SPCC Plan would adequately protect surface waters, including water supply areas, in the proposed project area.

By implementing the construction and restoration procedures specified in their ESC Plan, we believe that the potential impacts to surface waterbodies discussed above from construction in and around these areas would be minimized to the extent practicable, would be temporary in nature, and would cause no long-term negative impacts to surface water quality.

Directional Drill

Section 2.3.2.3 provides a general description of HDD construction methods. Islander East would conduct comprehensive geotechnical investigations prior to committing to HDD the Carmans River and the portion of the route from the Connecticut landfall out into the Sound. Geotechnical investigations are necessary in New York because the pipeline route passes through regions containing soils of glacial origin that may contain cobbles, boulders, layers of gravel, and non-cohesive sands. These soil types may not be conducive to the use of HDD technology. In Connecticut, it is believed that the portion of the pipeline route to be directionally drilled should be primarily in bedrock. Geotechnical investigations are necessary for verification and have begun off the Connecticut coast. Analysis of the data collected is ongoing, but preliminary indications are that HDD should be feasible there.

Once begun, a HDD can fail for various reasons, including failure to complete the pilot hole, inability to maintain a stable open hole, loss of the hole opening tool because it becomes lodged or twists off, inability to pull the pipe back through the hole, or loss of the drill head due to obstacles encountered that push the drill out of alignment during drilling. For these reasons, Islander East has prepared and submitted to the Secretary a plan for an alternate method to cross the Carmans River in New York if the drill fails. This plan proposes a dry flume crossing method in the event that the HDD is not successful. Expected impacts from this type of crossing would be greater than those associated with an HDD crossing. This plan, however, does not include site-specific scaled drawings identifying all areas that would be disturbed by construction. Therefore, **we recommend that:**

- **In the event that the HDD of the Carmans River fails, Islander East should file with the Secretary an updated plan including site-specific drawings identifying all areas that would be disturbed by construction using the dry flume crossing method at the Carmans River on Long Island. Islander East should file this plan concurrent with its application to the COE for a permit to construct using this plan. The Director of OEP must review and approve this plan in writing before construction of the crossing.**

In addition, Islander East has not provided a plan that addresses an alternate crossing method for the proposed HDD from the Connecticut landfall out into the Sound. Therefore, **we recommend that:**

- **Islander East should file with the Secretary a plan for the crossing of the Connecticut shore if the directional drill is unsuccessful. This should be a site-specific plan that includes scaled drawings identifying all areas that would be disturbed by construction. Islander East should file this plan concurrent with its application to the COE for a permit to construct using this plan. The Director of OEP must review and approve this plan in writing before construction of the crossing.**

For the Carmans River crossing, HDD would involve drilling of a pilot hole beneath the waterbody to the opposite bank. At the Connecticut shore, HDD would involve drilling of a pilot hole beneath the shoreline to a point approximately 3,500 feet offshore in the Sound. In both cases, the hole would be enlarged with one or more passes of a reamer until the hole is the correct diameter. A prefabricated pipe segment is then pulled through the hole to complete the crossing. A successful HDD is considered to be a preferred crossing method for sensitive waterbodies. However, there are certain impacts that could occur as a result of the drilling, such as an inadvertent release of drilling mud. This could occur in the area of the mud pits or tank, or along the path of the drill due to unfavorable ground conditions. Drilling mud is most often comprised of naturally-occurring materials, such as bentonite, which in small quantities would not be detrimental to vegetation, fish, or wildlife. In large quantities, the release of drilling mud into a waterbody could affect fisheries and vegetation by temporarily inundating these species until the mud is dispersed. Expected impacts, however, would be significantly less than those associated with an open-cut crossing.

Islander East has stated that it would prepare HDD plans in support of state waterbody crossing permit applications, if required by state agencies. We believe that such plans are a necessary component for completing an HDD with the least environmental impact. Therefore, **we recommend that:**

- **Islander East should submit a site-specific Directional Drill Contingency Plan for each of the proposed directional drill crossings. Each Directional Drill Contingency Plan should address how Islander East will:**

  a. handle any inadvertent release of drilling mud into the waterbody or areas adjacent to the waterbody, including procedures to contain inadvertent releases;
  b. seal the abandoned drill hole; and
  c. clean up any inadvertent releases.

  Islander East should file each plan with the Secretary for review and written approval by the Director of OEP, before construction.

Hydrostatic Test Water

Islander East and Algonquin would hydrostatically test the new pipeline sections prior to placing them in service to verify integrity. This test consists of pressurizing the pipeline with water and checking for pressure losses due to leakage. Hydrostatic testing would be performed in accordance with DOT safety regulations (see section 2.3.1.6).

Islander East has identified individual source and discharge locations for the hydrostatic test water. Table 3.3.2-3 presents the milepost locations and approximate water volumes that would be used. Pre-installation hydrostatic tests would be conducted on the directional drill segment. The rest of the pipeline segments, along with the directional drill segment, would be hydrostatically tested following installation and prior to being placed into service.

Withdrawal of hydrostatic test water could temporarily affect downstream users and aquatic organisms (primarily fish) if the diversion constitutes a large percentage of the source's total flow or volume. Potential impacts include temporary disruption of surface water supplies, temporary loss of habitat for aquatic species, increased water temperatures, depletion of dissolved oxygen levels, and temporary disruption of spawning, depending on the time of withdrawal and current downstream users. These impacts would be minimized by obtaining hydrostatic test water from bodies of water with sufficient flow or volume to supply required test volumes without significantly affecting downstream flow. All sources proposed by Islander East have sufficient flow or volume to support hydrostatic test water withdrawals. Impacts to fish would further be avoided by performing hydrostatic testing during non-spawning periods and by screening the intake hoses to prevent entrainment of fish and other aquatic life. Potential impacts to fishery resources are discussed in section 3.4.1.

TABLE 3.3.2-3
Hydrostatic Test Water Volumes and Fill and Discharge Locations

State/Facility	Test Site MP (fill/discharge)	Estimated volume (gal)	Source Location	Discharge Location
Connecticut				
AGT Pipelines Retest	8.9/8.9	1,019,000	Quinnipiac River	Quinnipiac River
Islander East Pipeline	2.2/2.2	1,200,000	Private Pond	Private Pond
Long Island Sound	Offshore Connecticut	2,680,000	Long Island Sound	Long Island Sound
New York				
Islander East Pipeline	Not yet identified [a]	1,400,000	BNL or Suffolk County wells	Not yet identified [a]
Calverton Lateral	Not yet identified [a]	660,000	Municipal water system	Not yet identified [a]

a/ Will be identified in final EIS.

BNL = Brookhaven National Laboratory

As shown on table 3.3.2-3, water used for hydrostatic testing would be returned to the waterbody where it was appropriated. Potential impacts resulting from the discharge of hydrostatic test waters into streams and ponds could include erosion of soils and some subsequent degradation of water quality from increased turbidity and sedimentation. High-velocity flows could cause erosion of the stream banks and stream bottom, resulting in temporary release of sediment. Islander East and Algonquin have identified in the ESC Plan procedures to minimize these potential adverse impacts. These include use of energy dissipation devices and installation of sediment barriers, controlling the discharge rate, and properly selecting discharge locations.

No chemical additives would be introduced to the water used to hydrostatically test the new pipeline, and no chemicals would be used to dry the pipeline following the hydrostatic testing. Because the AGT retest sections are not new pipeline, Algonquin would discharge hydrostatic test water into large tanks (frac tanks) and filter the water prior to discharge. Hydrostatic testing would be conducted in accordance with applicable permits and Islander East's and Algonquin's ESC Plan.

By implementing the mitigation measures described above and included in Islander East's and Algonquin's ESC Plan, we believe that hydrostatic testing would not significantly impact surface waters identified to date, or nearby upland areas.

3.3.3 Long Island Sound

3.3.3.1 Existing Environment

The Sound is bounded by Connecticut on the north and by Long Island, New York on the south. The waterbody is approximately 113 miles long (east to west) and approximately 20 miles across (north to south) at its widest point. Mid-Sound depths vary between 60 and 130 feet. Whereas most estuaries have a single outlet to the sea, the Sound is unique in that it has two connections with the sea. The Sound is open through The Race to the east and through the East River and New York Harbor to the west. The Sound Watershed encompasses approximately 16,000 square miles, and includes the Connecticut, Quinnipiac, Housatonic, Norwalk, and Thames rivers.

The Sound has water quality characteristics at certain times of the year and in certain portions that fluctuate more extremely between estuarine conditions and marine conditions. As a generally enclosed coastal body of water, it shares some characteristics typical of other southern New England estuaries. For instance salinity can vary tremendously from strictly marine levels around 34 parts per thousand to nearly freshwater in harbors with large coastal rivers during spring snowmelt. Generally, the majority of the water volume in the Sound remains near marine conditions or slightly lower. Because the Sound has two openings instead of one, there is more through-flow of water induced by tidal forces and wind. In the project vicinity, New Haven Harbor, Connecticut (fed by the Quinnipiac River) provides a source of freshwater input to the Sound, but sufficient mixing occurs in the intervening 8 miles that the influence is minor. On the Long Island side of the Sound, the Wading River provides a much smaller volume of freshwater to the nearshore environment. With the anthropogenic input of contaminants into surface waters linked primarily to freshwater input into the Sound, the nature and extent of contaminants and nutrient loading are linked to larger rivers. The project area is distant enough from potential source areas that levels are low, as evidenced by the presence of oyster leases that are used for depuration.

The primary water quality issue in the Sound is hypoxia, or low levels of dissolved oxygen. Excess nitrogen causes the growth of phytoplankton, which sink to the bottom and decay. The decaying process consumes the scarce oxygen at the bottom. Although vertical water mass mixing is usually present, during prolonged calm periods such as late summer, deeper waters can become isolated from surface waters as a result of a sharp thermal gradient formation. Surface waters are generally oxygen-rich due to photosynthesis and wave activity. However, oxygen demand is generally greater than supply in the lower water levels, often reducing oxygen to lethal levels for fish and some benthic or bottom dwelling species.

Sediment Transport in Long Island Sound

The sedimentary environments for the entire Sound basin were recently mapped (Knebel and Poppe, 2000). Four primary bottom sedimentary environments were identified in the Sound: erosion or nondeposition, coarse-grained bedload transport, sediment sorting and reworking, and fine-grained deposition (figure 3.3.3-1). The Sound primarily consists of an east-to-west decreasing gradient of tidal-current speeds coupled with the westward-directed estuarine bottom drift controlling the regional distribution of sedimentary environments. This flow regime has created a westward succession of environments beginning with erosion or nondeposition at the narrow eastern entrance to the Sound that changes to an extensive area of coarse-grained bedload transport in the

East-Central Sound. This area is adjacent to a contiguous band of sediment sorted with broad areas of fine-grained deposition on the flat basin floor in the Central and Western Sound (Knebel and Poppe, 2000).

Islander East conducted hydrographic, sub-bottom profile, side-scan sonar, magnetometer, and acoustic doppler surveys to characterize the sea floor and underlying shallow stratigraphy along the pipeline corridor across the Sound. Sediments identified in this study range in size from silty-clay to cobbles, intermixed with and overlying deposits of glacial till and rock. Islander East has also filed some initial site-specific surveys that confirm that most sediments along the pipeline route are fine-grained silts and clays. These surveys agree with reports (Knebel and Poppe, 2000) that the majority of the route is within an area of fine-grained sediments. Factors governing sediment transport and the associated mass flux in coastal waters generally include bedload and suspended load transport. Sediment transport within the region of central Long Island Sound along and adjacent to the Islander East Pipeline route is governed by the combined effects of wind, waves, and tidal currents. Generally, the combination favors low transport energies and the development of a depositional environment. The prevalence of fine-grained cohesive sediments in central Long Island Sound reduces the amount of material displaced in disturbed areas due to currents. Sediment transport in this area is dominated by materials carried in suspension by turbulent flows.

The report determined that the regional east-to-west succession of sedimentary environments indicates that the Sound is highly efficient at trapping fine-grain sediments (Knebel and Poppe, 2000). Sediments derived from coastal rivers and erosion and winnowing of the sea floor are sequestered in the central and western parts of the basin. This distribution information provides insight into the long-term fate of contaminants, specifically those associated with fine-grained sediments.

Islander East has filed a *Long Island Sound Sampling, Analysis, and Study Plan* (Study Plan) that describes its approach to characterizing sediments potentially affected by the project and assessing site-specific sediment plume or HDD fluid release plume transport. Data on water quality, sediment grain size distribution, and currents is being collected, in addition to mapping sensitive habitats in the area. Complete results of this study will be incorporated into the FEIS, when available.

Contaminated Sediments in Long Island Sound

The water and sediment quality of many coastal waters in the area are impacted by proximity to urban centers and by industrial and agricultural activities. Pollutants enter in the form of sewage effluent, industrial discharge, dredge spoils, urban runoff, riverine discharge, and atmospheric deposition. Semi-enclosed marine areas, such as the Sound, are particularly sensitive to anthropogenic inputs because their sediments and water may be less efficiently removed, dispersed, and diluted (Buchholtz ten Brink and Mecray, 1998).

Clostridium perfringens is a bacterium present in the intestinal tract of mammals. This bacteria, and its endospores, are excreted in human fecal material, pass through the sewage treatment process, and are discharged with effluent and sludge into the environment. Since the spores are inert in most temperate marine sediments, as both anoxia and elevated temperatures are necessary for significant growth, the presence of *Clostridium perfringens* spores in sediment provides a record of sewage input into an ecosystem. In addition to directly tracing sewage, the concentrations of these spores are tracers for the magnitude and distribution of other urban contaminants in sediments because sewage discharge is often a significant source of pollutant metals (e.g., silver, copper, zinc, mercury) and other contaminants in coastal waters (Buchholtz ten Brink et al., 2000).

Clostridium perfringens concentrations range from non-detectable to approximately 15,000 spores per gram of dry sediment within the Sound (Buchholtz ten Brink et al., 2000). The highest values occur in the west and west-central portions of the Sound, with very low concentrations in the east, and intermediate concentrations in the east-central basin.

It was reported (Mecray and Buchholtz ten Brink, 2000) that high concentrations for other contaminants (e.g., heavy metals) also followed the distribution of sediments, with the greatest concentrations of contaminants in the fine-grained deposition areas. In the general depositonal area where the project is located, silver, calcium, cadmium, chromium, copper, manganese, nickel, lead, and zinc occur in levels higher than the natural background levels in the Sound. Because no site-specific data was available on potential contaminants along the proposed pipeline route, Islander East collected site-specific sediment samples to characterize the sediments in the area, as described in the Study Plan. These data reveal that nearshore sediment samples had concentrations below all available screening criteria. However, nickel and arsenic occur in sediments between MPs 13 and 17 and MPs 24 and 30 at levels slightly exceeding the National Oceanic and Atmospheric Administration's (NOAA) Effects Range-Low (ERL) sediment screening criteria, but below the Effects Range-Medium (ERM) levels (see appendix H for concentrations). Contaminant concentrations between the ERL and ERM criteria are generally accepted as indicating moderate contamination. Data collected did not identify any "hot spots"; sediment quality appears to be fairly consistent along the pipeline route. Although no highly contaminated areas were identified, we recommend that:

- **Islander East should file the completed site-specific contaminated sediment studies in the Sound with the appropriate Federal or state agencies with regulatory authority, and consult with these agencies, to determine which, if any, known or suspected contaminated sites require further investigation and what mitigation may be employed to minimize impact in the event that contaminated areas are crossed. Islander East should file with the Secretary any comments received from regulatory agencies, before construction, for review and written approval from the Director of OEP.**

3.3.3.2 Environmental Consequences

Many commentors were concerned with potential impacts to the Sound. The most significant potential impacts to water quality in the Sound from pipeline construction are from sediment resuspension/redeposition from trenching and burial of the pipeline, release of HDD fluids, underwater blasting, accidental fuel spills, and discharges of hydrostatic test water.

Trenching and Pipeline Burial

Islander East has proposed three types of offshore construction techniques (see sections 2.3.3 and 2.3.4 for detailed discussions of these methods): subsea plowing or jetting waters deeper than 25 feet; and dredging for the Long Island mainland approach, and after the HDD exit point, in water less than 25 feet deep. In addition, in shallow waters (less than 10 feet deep), a flotation trench configuration is necessary to accommodate the barge. Cross-sectional representations of each method are shown in sections 2.3.3 and 2.3.4. Any method used would impact bottom sediments in the Sound. The impacts would be from displacement or disturbance of bottom sediments, and the resultant release of sediments into the water column causing increased turbidity. This re-suspension of sediments into the water column can temporarily affect water quality through the reduction of dissolved oxygen and depth of light penetration, as well as potentially releasing contaminants.

Construction activities create increases in turbidity, which limits light penetration necessary for photo synthetic oxygen production. Coarse sediments generally settle quickly, whereas finer sediments remain suspended in a plume for longer periods of time.

Impacts related to sediments within the Sound can be quantified in both volumetric (three dimensional) and areal or lateral (two dimensional) terms. The majority of volumetric displacement of bottom materials would occur from construction of the trench by jetting, seaplowing or dredging. The method of trenching determines the quantity of sediments displaced, with dredging causing the least displacement and jetting the greatest. The estimated quantities, in cubic yards, of sediment displaced by each method for this project are: dredging (239,400), plowing (504,400), and jetting (662,000). Of these methods, subsea plowing causes the least amount of sediment to be released to the water column, although this method would disturb more sediments than dredging. This is because dredging causes more sediment dispersal during the lifting and dumping of the dredge bucket.

Anchors used in moving the lay and burying barges would also disturb bottom materials. The vast majority of the two-dimensional area of the sea floor disturbed during construction would be caused by cable sweep, which occurs when the anchors are moved. Islander East proposes to use mid-line buoys to minimize the area of sea floor disturbed by cable sweep. Table 3.3.3-1 lists the impact area in acres for the jetting and plowing construction methods, with and without midline buoys. As shown on the table, midline buoys would reduce the area disturbed by approximately 50 percent.

The nearshore segments of the pipeline route in the Sound are within erosion or nondeposition and sediment sorting and reworking environments (about MPs 10.12 to 11 and 30.2 to 32.7), but the majority of the proposed Islander East Pipeline route is within the Sound's fine-grained sediment deposition area (about MPs 11 to 30.2). Once disturbed, these fine-grained sediments would become temporarily suspended in the water column, resulting in a "plume" of turbid water that drifts with the water currents and eventually would settle on the bottom. The plume's duration, extent of dispersal, and aggregation rate of the suspended particles depend on many site-specific variables. These variables include, but are not limited to, the physical composition and size of the suspended particles, water depth and temperature, current velocity and tidal stage, wind direction and speed, etc.

A study by Signell et. al, 2001 describing the physical conditions in the Long Island Sound that affect sediment suspension notes that fine sediments along coastal margins are regularly resuspended by tidal currents, that storm related events occur between 10-20 times per year that can redistribute fine sediments to depths of 20 meters, but in depths greater than 20 meters, the frequency of wind or tidal driven currents with velocities to resuspend fine sediments is infrequent. Nearshore depths in Connecticut and New York are less than 20 meters, while mid-sound depths along the pipeline route vary between 18 and 39 meters. From the above, it is clear that the duration of suspension and distribution of fine sediments disturbed by construction would be variable and highly dependent on site-specific conditions at the time of trenching, but that sediment resuspension by natural forces occurs more frequently in the nearshore environments.

TABLE 3.3.3-1

Area of Sound Bottom Disturbed by Proposed Construction Methods

Construction Method: Trenching by Plowing, with Buoys

	Impact (Acres)			
Impact Type	**Construction Operations**	**Burial Operations**	**Total [a]**	**Key Assumptions**
Anchor scars [b]	2.4	7.3	9.7	10-point mooring, 3 anchor sets/mile, 4 passes, anchor is 8.6 feet wide by 10 feet long, with a 20-foot drag.
Anchor cable sweep [c]	836	1,971	2,807	10-point mooring, 3 anchor sets/mile, midline buoys. One lay pass, two plow passes, one backfill pass.
Trenching [d]	21	182	203	Construction operations includes dredge trench and associated spoil mounds. Burial operations includes trench and associated spoil mounds from plowing.
Sediment Redeposition	0	0	0	Estimated redeposition occurs within the impact acreage shown in "Trenching".
Pipeline stabilization [e]	0	0.4	0.4	Assume that pipeline stabilization/protection at both crossings is provided by 400-foot by 20-foot covering of segmented concrete mats.
HDD exit hole	0.7	1.7	2.4	Spoil mound of approximate 6,400 cubic yard volume, spread evenly around exit hole.
TOTAL	860	2,162	3,022	

a/ Some calculation differences may occur due to rounding.
b/ Total area from initial anchor touch-down point, through anchor drag, to set point.
c/ Total area contacted by anchor cables, chains, or other related equipment during anchor settings operations and barge movement; through picking up and setting of anchor at next set point.
d/ Total area of trench plus spoil banks. Also includes any dredging for barge channels. Minimum water depth ~13', additional dredging for barge channels is not required. 125% bulking factor in spoil mounds. Approx. 2' overcut in all trenches.
e/ Total area impacted by anchoring system for non-burial of pipelines.

TABLE 3.3.3-1 (continued)

Area of Sound Bottom Disturbed by Proposed Construction Methods

Construction Method: Trenching by Jetting, with Buoys

Impact Type	Impact (Acres) Construction Operations	Burial Operations	Total [a]	Key Assumptions
Anchor scars [b]	2.4	4.9	7.3	10-point mooring, 3 anchor sets/mile, 4 passes, anchor is 8.6 feet wide by 10 feet long, with a 20-foot drag.
Anchor cable sweep [c]	836	1,435	2,271	10-point mooring, 3 anchor sets/mile, midline buoys. One lay pass, two jetting passes, all sweep overlap benefit included in burial operations.
Trenching [d]	21	102	123	Construction operations includes dredge trench and associated spoil mounds. Burial operations includes trench only from post-lay lowering.
Sediment Redeposition	0	625	625	Assume spoil would cover a total area of 150 feet on either side of centerline, less the width already accounted for in "Trenching".
Pipeline stabilization [e]	0	0.4	0.4	Assume that pipeline stabilization/protection at both crossings is provided by 400-foot by 20-foot covering of segmented concrete mats.
HDD exit hole	0.7	1.7	2.4	Spoil mound of approximate 6,400 cubic yard volume, spread evenly around exit hole.
TOTAL	860	2,169	3,029	

a/ Some calculation differences may occur due to rounding.
b/ Total area from initial anchor touch-down point, through anchor drag, to set point.
c/ Total area contacted by anchor cables, chains, or other related equipment during anchor settings operations and barge movement; through picking up and setting of anchor at next set point.
d/ Total area of trench plus spoil banks. Also includes any dredging for barge channels. Minimum water depth ~13', additional dredging for barge channels is not required. 125% bulking factor in spoil mounds. Approx. 2' overcut in all trenches.
e/ Total area impacted by anchoring system for non-burial of pipelines.

TABLE 3.3.3-1 (continued)
Area of Sound Bottom Disturbed by Proposed Construction Methods

Construction Method: Trenching by Plowing, without Buoys

Impact Type	Impact (Acres) Construction Operations	Burial Operations	Total [a]	Key Assumptions
Anchor scars [b]	2.4	7.3	9.7	10-point mooring, 3 anchor sets/mile, 4 passes, anchor is 8.6 feet wide by 10 feet long, with a 20-foot drag.
Anchor cable sweep [c]	2,765	3,150	5,915	10-point mooring, 3 anchor sets/mile. One lay pass, two plow passes, one backfill pass. All sweep overlap benefit included in burial operations.
Trenching [d]	21	182	203	Construction operations includes dredge trench and associated spoil mounds. Burial operations includes trench and associated spoil mounds from plowing.
Sediment Redeposition	0	0	0	Estimated redeposition occurs within the impact acreage shown in "Trenching".
Pipeline stabilization [e]	0	0.4	0.4	Assume that pipeline stabilization/protection at both crossings is provided by 400-foot by 20-foot covering of segmented concrete mats.
HDD exit hole	0.7	1.7	2.4	Spoil mound of approximate 6,400 cubic yard volume, spread evenly around exit hole.
TOTAL	2,789	3,341	6,131	

a/ Some calculation differences may occur due to rounding.
b/ Total area from initial anchor touch-down point, through anchor drag, to set point.
c/ Total area contacted by anchor cables, chains, or other related equipment during anchor settings operations and barge movement; through picking up and setting of anchor at next set point.
d/ Total area of trench plus spoil banks. Also includes any dredging for barge channels. Minimum water depth ~13', additional dredging for barge channels is not required. 125% bulking factor in spoil mounds. Approx. 2' overcut in all trenches.
e/ Total area impacted by anchoring system for non-burial of pipelines.

TABLE 3.3.3-1 (continued)

Area of Sound Bottom Disturbed by Proposed Construction Methods

Construction Method: Trenching by Jetting, without Buoys

	Impact (Acres)			
Impact Type	**Construction Operations**	**Burial Operations**	**Total [e]**	**Key Assumptions**
Anchor scars [b]	2.4	4.9	7.3	10-point mooring, 3 anchor sets/mile, 4 passes, anchor is 8.6 feet wide by 10 feet long, with a 20-foot drag.
Anchor cable sweep [c]	2,765	2,565	5,330	10-point mooring, 3 anchor sets/mile. One lay pass, two jetting passes, all sweep overlap benefit listed in burial operations.
Trenching [d]	21	102	123	Construction operations includes dredge trench and associated spoil mounds. Burial operations includes trench only from post-lay lowering.
Sediment Redeposition	0	625	625	Assume the spoil would cover a total area of 150 feet on either side of centerline, less the width already accounted for in "Trenching".
Pipeline stabilization [e]	0	0.4	0.4	Assume that pipeline stabilization/protection at both crossings is provided by 400-foot by 20-foot covering of segmented concrete mats.
HDD exit hole	0.7	1.7	2.4	Spoil mound of approximate 6,400 cubic yard volume, spread evenly around exit hole.
TOTAL	2,789	3,299	6,088	

a/ Some calculation differences may occur due to rounding.
b/ Total area from initial anchor touch-down point, through anchor drag, to set point.
c/ Total area contacted by anchor cables, chains, or other related equipment during anchor settings operations and barge movement; through picking up and setting of anchor at next set point.
d/ Total area of trench plus spoil banks. Also includes any dredging for barge channels. Minimum water depth ~13', additional dredging for barge channels is not required. 125% bulking factor in spoil mounds. Approx. 2' overcut in all trenches.
e/ Total area impacted by anchoring system for non-burial of pipelines.

The highly variable conditions in the project area make it difficult to predict the duration and areal extent of a turbidity plume from Islander East's construction activities, as well as the resulting depth of sedimentation. As discussed below, Islander East is proposing site-specific computer modeling of sediment transport to quantify these affects in the potentially affected areas. However, we have included our own preliminary quantitative analysis, based on available site-specific data, previous modeling in the Sound for Iroquois' Eastchester Project (Docket No. CP00-232-000), and our experience from other projects.

For the Eastchester Project, six scenarios were considered using a range of bottom currents in the Sound (0.49, 0.66, and 0.98 foot/second) and two representative grain size distributions (67.7 percent fines and 96.3 percent fines). Initial site-specific data filed by Islander East indicates that most of the sediments crossed by the pipeline route are fine-grained silts and clays (95+ percent fines), and that current speeds in the Connecticut nearshore waters are generally in the lower range of those used in the Iroquois modeling. Because current speeds and sediment grain size are two of the key modeling input parameters, and Islander East's site-specific data for these key parameters fall within the ranges used for the Eastchester modeling, we believe that the Eastchester results are applicable for use in the following quantitative impact analysis. As additional site-specific data are received, we will update our analysis, as appropriate, for the final EIS.

For jetting, the Eastchester model predicted a visible turbidity plume (greater than 29 NTU or 30 mg/L total suspended solids) up to 7,800 feet in length and 1,900 feet in width. For mechanical dredging, a plume about 2,600 feet long by 1,300 feet wide was predicted. We believe that plowing disturbances would be similar to the range predicted for mechanical dredging (see section 3.4.1.2).

Because of shallow water depths (less than 15 feet) in the area of the HDD exit point, Islander East is proposing to use mechanical dredging from the exit point for approximately 1 mile until water depths of 20 feet are encountered. We therefore believe that the plume in this area could be on the order of 2,600 feet long by 1,300 feet wide if currents are consistent with the data already submitted. From approximately MP 12, Islander East proposes plowing the remainder of the Sound crossing. However, in the event that plowing equipment is not available, Islander East proposes the jetting method.

Direct impacts on offshore aquatic environments related to pipeline installation between MPs 12.00 and 32.15 would vary depending on the use of the jetting and subsea plow methods. The jetting construction method would require up to two passes of the jetting sled to create a 40-foot-wide by 8-foot-deep trench, and deposit the majority of trench spoil up to 130 feet[1] on either side of the trench, thereby affecting an estimated total surface area of 733 acres. Islander East estimated this method would dislodge 661,982 cubic yards of sediment from the 40-foot-wide trench, which would average 3.9 inches deep if all the trench spoil were deposited evenly 130 feet to either side of the trench. Based on the Eastchester model, we believe that the plume created by jetting could be on the order of approximately 7,800 feet in length and 1,900 feet wide.

We also include an estimated distribution pattern of the sediment displaced by jetting. The sediment plume created by jetting would be displaced primarily by the tidal currents, that flow perpendicular to the pipeline alignment. Based on the sediment types found in the sediment cores taken from along the alignment, it is estimated that approximately 50 percent of the jetted sediment

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[1] This is calculated based on the maximum depth of the Sound along the proposed alignment and is the maximum distance non-suspended materials may be deposited.

would be fluidized and become suspended (Kampf and Fitzpatrick, 2001). This material would produce the plume described above. Sediment distribution reported by Hayes, 1986, shows a sediment distribution with similar dimensions to that of the plume predicted above. Using Hayes' turbidity distribution, we estimate that sediment deposition would be thickest approximately 5 feet away from the trench comprising the largest and heaviest particulate matter. Farther from the trench, the thickness of the deposited sediment would gradually decline to where at 130 feet, there would be about 3.9 inches of deposited sediment. From that point on, sediment thickness would decline markedly. Between 130 feet and 4,500 feet from the trench, the average thickness of deposited sediment would be about 0.06 inch. Further than 4,500 feet from the trench, the deposition would most likely be negligible. As additional site-specific data area received, we will update our estimates, as appropriate, in the final EIS.

As discussed above, how long the sediment would stay in suspension is dependent on using site-specific parameters. Based strictly on settling rates for representative grain sizes, the particles could settle through 130 feet of water in 0.3 to 7.7 days (Teeter, 1993).

Alternatively, the subsea plow construction method would also require two passes of the plow, an initial pass to excavate the trench and a subsequent pass to bury the pipe. The subsea plow would create a 25-foot-wide by 8-foot-deep trench, and deposit the majority of trench spoil 25 feet to either side of the trench, thereby impacting an estimated total surface area of 183 acres. Islander East estimated this method would dislodge 504,367 cubic yards of sediment from the 25-foot-wide trench, which would average 20.5 inches deep if all the trench spoil were deposited evenly 25 feet to either side of the trench. Because plowing does not fluidize bottom sediments like jetting, sediment suspension from this technique would be minimal.

A comparison of the direct and indirect effects of jetting versus plowing indicates that plowing would have different impacts than jetting. Direct impacts from either method could include disturbances to the marine environment and biota from trenching and spoil movement, anchor scars, and cable sweep, but the magnitude is related to the construction technique used. Indirect impacts would include sediment plume turbidity and silt deposition. Direct impacts such as habitat alteration; sediment disturbance, transport, and deposition; and potential adverse affects to marine organisms, including mortality, can be greater with plowing than jetting in the immediate vicinity of the trench, depending on the volume of bottom sediment displaced. However, because plowing does not fluidize bottom sediments like jetting, sediment suspension is minimal compared to jetting, and the indirect impacts from sediment suspension and transport would be substantially greater from jetting than from plowing. The ratio of direct impacts versus indirect impacts would be higher for plowing than for jetting, but the overall quantity in acres of both direct and indirect impacts could be significantly less for plowing than for jetting. The primary concern is impacts to benthic marine organisms, particularly shellfish beds located between MPs 12 and 13, and fisheries resources and habitats in the nearshore and shallow marine environment. Potential direct and indirect impacts to marine organisms are discussed in section 3.4.1, Fisheries.

In addition to affecting turbidity levels during construction, if the pipeline is not completely buried, its presence on the sea floor would cause changes in the natural sea floor contour. This may impact natural sediment transport processes due to changes in wave propagation and current flows over the impacted areas.

As mentioned above, Islander East is preparing site-specific computer modeling in order to quantify the potential impacts to the Sound from sediment displacement and resultant increases in turbidity, and impacts to natural sediment transport processes due to potential current regime changes. This information would provide additional quantitative guidance in the specification of engineering designs and protocols intended to minimize and/or eliminate adverse environmental affects. Therefore, **we recommend that:**

- **Islander East should file the data from the site-specific Sound sedimentation investigations and computer modeling results with the Secretary, before the issuance of the final EIS.**

We anticipate that we will receive this information by mid-April 2002 and be able to analyze the report in time to update our analysis for the final EIS.

HDD Fluids

The release of drilling fluids has the potential to impact water quality. Drilling fluids or "muds" would be circulated through the borehole during drilling/reaming operations to lubricate the bit and drill pipe, stabilize the hole, carry the cuttings away from the drill bit, and eventually to reduce friction on the pipeline as it is pulled through the hole. A pit would be excavated at the workspace on land that would contain drilling mud there. However, some release of drilling fluids would be expected during construction at the directional drill exit point off the Connecticut coast. The total quantity of drilling fluids that would be used is estimated at approximately 448,300 barrels (bbls), containing approximately 3,000 cubic yards of bentonite and 1,900 cubic yards of native rock cuttings. During the HDD process, it is typical to contain and recover much of the drilling fluids. Islander East is in the process of evaluating the engineering feasibility of several different containment measures for drilling mud at the HDD exit point in the Sound. These containment measures would be erected to contain and restrict any such releases of drilling fluids and to limit such impacts to the immediate area of the HDD exit point. At this stage of the analysis, Islander East has estimated that 60 percent should be recoverable. In this case, approximately 183,000 bbls, containing approximately 1,230 cubic yards of bentonite and 760 cubic yards of native rock cuttings, could be released to the Sound over the 3-month drilling period.

The drilling fluids would consist of bentonite clay, native rock cuttings, and freshwater with no additives; these fluids are benign and do not exhibit a toxic capacity. Thus, the primary concern from releases of drilling muds at the HDD exit point is an increase in the tubidity of the Sound. Because most of the drilling fluids would be expected to be more dense than sea water, they would sink to the sea floor and disperse in surrounding waters. Therefore, it is expected that impacts to water quality would be short-term in nature and likely confined to a small area. The site-specific computer modeling discussed above that Islander East proposes would aid in quantifying the magnitude and intensity of the turbidity increases from drilling mud releases at the HDD exit point. We will review and analyze this information and incorporate our analysis into the Final EIS.

There is a potential that drilling fluids could inadvertently be released to the Sound along portions of the drilled segment through fractures in the bedrock. However, the results of the geotechnical investigation conducted to date indicate that overburden (primarily silt, overlying the bedrock) thickness along the HDD route varies from 25 to 90 feet. It is thus expected that any drilling mud released through fractures in the bedrock would be contained within the overburden and would not be released to the Sound.

Underwater Blasting

As discussed in section 3.1.1.2, there is potential for underwater blasting of bedrock near the Connecticut shore between MPs 11.79 to 11.83 where shallow bedrock may be encountered. Blasting would release fine grained material to the water column, locally increasing turbidity. Due to the limited area with potential for blasting, the short-term nature of the activity, and the nature of the material blasted, we believe that increases in turbidity would be short-term and long-term impacts to water quality would not occur. Potential blasting impacts on fisheries are discussed in section 3.4.1.

Accidental Fuel Spills

All contractors are required to comply with Federal regulations related to fuel handling and spills in offshore areas. Islander East would be required to provide a spill response plan to the U.S. Coast Guard to cover potential spill events that could occur in navigable water. The volumes of fuel potentially involved are expected to be on the order of tens to hundreds of gallons. Implementation of standard spill response techniques for spills of this size should minimize adverse impacts to water quality of Long Island Sound. Such impacts would be expected to be short-term in nature, as quantities of spilled fuel not able to be collected would likely be minor and would be dispersed and diluted by wind and wave action.

Hydrostatic Test Water

Discharge of hydrostatic test water has the potential to affect water quality along the proposed pipeline route. Islander East has stated that they would use water from the Sound for the offshore hydrotests and discharge this water into the source from which it was obtained. The discharges would be conducted in strict accordance with the applicable state and Federal regulations. Islander East has stated that no chemical additives would be used either for the hydrostatic test or for drying the pipeline after the test. We therefore believe that the hydrostatic test as proposed would not adversely affect water quality of the Sound.

3.4 FISH, BENTHIC COMMUNITIES, AND WILDLIFE

3.4.1 Fisheries Resources

3.4.1.1 Existing Environment

Surface waters crossed by the Islander East Pipeline Project support warmwater, coldwater, diadromous (anadromous and catadromous), and marine fisheries. Representative recreational or commercial important fish species known to occur within the project area are listed in table 3.4.1-1.

Warmwater streams and rivers are typically slow moving, less oxygenated waterbodies with soft substrates of sand and silt. The only warmwater fishery stream (Peconic River, MP 38.5) crossed by the project is in New York. Largemouth bass, black crappie, northern pike, and white perch are important recreational warmwater species known to occur in this stream.

Coldwater streams and rivers are typically fast moving, well oxygenated, low temperature waterbodies with hard substrates of gravel, cobble, or rock. All of the streams crossed in Connecticut are listed as coldwater fishery streams and one coldwater fishery stream (Carmans River, MP 43.2) would be crossed in New York. Brook and brown trout are important recreational coldwater species known to occur in the streams crossed by the proposed project.

Diadromous fish species migrate from saltwater to freshwater to spawn (anadromous) or from freshwater to saltwater to spawn (catadromous). In addition to being designated as coldwater streams, the Farms River and Stony Creek in Connecticut are also designated as supporting anadromous fisheries.

TABLE 3.4.1-1
Recreational or Commercial Important Fish Species Known to Occur in the Project Area

Warmwater	Coldwater	Diadromous	Marine
Largemouth Bass	Brook Trout [a]	Eels	Butterfish
Yellow Perch	Brown Trout [a]	Menhaden	Summer Flounder
Black Crappie	Atlantic Salmon [a]	Smelt	Silver Hake
Sunfish		Striped Bass	Weakfish
Northern Pike		Shad	Winter Flounder
Pickerel		Sturgeon	Scup
Carp			Black Sea Bass
Suckers			Bluefish
Lampreys			Atlantic Mackerel
Bullhead			Pollock
White Perch [a]			Red Hake
			Windowpane
			Sandbar Shark
			Sand Tiger Shark
			American Lobster
			Crab
			Oyster
			Clam
			Conch
			Scallop
			Squid

a/ = Sea-run species are diadromous.

Marine habitats include estuarine, mouths of tidally influenced coastal streams and rivers, and intertidal and subtidal habitats. Marine and intertidal habitats support both diadromous fisheries and marine fisheries, such as coastal finfish, shellfish, and benthic invertebrates. Shellfish and other marine species may be present at the marine open water and mudflat areas of the Sound or at the mouths of the coastal streams and rivers. Islander East has developed and is in the process of conducting the Study Plan for the proposed Islander East Pipeline Project to evaluate marine benthic organisms and habitat along the pipeline route in the Sound.

Essential Fish Habitat-Designated Species

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996, set forth several new mandates for the U.S. Department of Commerce (USDOC), National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), regional fishery management councils, and other Federal agencies to identify and protect important marine and anadromous fish habitat. Although the concept of essential fish habitat (EFH) is similar to "critical habitat" under the ESA of 1973, measures recommended to protect EFH are advisory, rather than prescriptive.

The councils, with assistance from NMFS, are required to delineate "essential fish habitat" for all managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either current or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; and areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle.

EFH-designated species and life history stages in the project area were identified based on a list in the National Oceanic and Atmospheric Administration's *Guide to EFH Designations in the Northeastern United States* (USDOC 1999). The guide lists EFH-designated species in selected 10-minute by 10-minute squares of latitude and longitude as assigned by regional fishery management councils (table 3.4.1-2). The EFH-designated species and their respective life stages are listed in table 3.4.1-3.

3.4.1.2 Environmental Consequences

Impacts on fishery resources as a result of pipeline construction across or adjacent to waterbodies could be caused by direct disruption of bottom sediments from trenching and associated sedimentation and turbidity; barge anchoring and cable sweep; acoustic shock; habitat and/or cover loss; and other impacts including interruption of fish spawning migration, entrainment of fish, and introduction of water pollutants or non-native species. In addition, potential impacts to commercial fisheries and shellfish beds, marine species migration, and EFH-designated species are specifically addressed.

<u>Direct Disruption of Bottom Sediments from Trenching and Associated Sedimentation and Turbidity</u>

Onshore

During construction of stream crossings, the concentration of suspended solids would be high for only short periods and short distances downstream and down current of the crossing. Proper sediment barrier installation and use of erosion control fencing, as required in Islander East's and

Algonquin's ESC Plan, would also limit the addition of sediment to the waterbodies from erosion of the cleared right-of-way. In-stream construction would be completed in less than 48 hours at each stream crossing. Therefore, impacts associated with in-stream construction would be temporary, and suspended sediment concentrations would return to background levels soon after construction in each stream is completed.

TABLE 3.4.1-2
Ten Minute Square Coordinate Designations Along the Islander East Pipeline Project in Long Island Sound

	North	East	South	West
Connecticut Coastline	41°20' N	72°40' W	41°10' N	72°50' W
Long Island Sound	41°10' N	72°40' W	41°00' N	72°50' W
Long Island Sound	41°10' N	72°50' W	41°00' N	73°00' W
Long Island Coastline	41°00' N	72°50' W	40°50' N	73°00' W

Source: USDOC, 1999.

TABLE 3.4.1-3
Summary of Essential Fish Habitat Designation (All Four Ten-Minute Squares)

Fish Species	Eggs	Larvae	Juveniles	Adults
Atlantic mackerel (*Scomber scombrus*)	x	x	x	x
Atlantic salmon (*Salmo salar*)			x	x
Atlantic sea herring (*Clupea harengus*)			x	x
American plaice (*Hippoglossoides platessoides*)			x	x
black sea bass (*Centropristus striata*)			x	
bluefish (*Pomatomus saltatrix*)			x	x
cobia (*Rachycentron canadum*)	x	x	x	x
king mackerel (*Scomberomorus cavalla*)	x	x	x	x
pollock (*Pollachius virens*)			x	x
red hake (*Urophycis chuss*)	x	x	x	x
scup (*Stenotomus chrysops*)	x	x	x	x
Spanish mackerel (*Scomberomorus maculatus*)	x	x	x	x
summer flounder (*paralicthys dentatus*)			x	
whiting (*Merluccius bilinearis*)				x
windowpane (*Scopthalmus aquosus*)	x	x	x	
winter flounder (*Pseudopleuronectes americanus*)	x	x	x	x
Shark Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
blue shark (*Prionace glauca*)				x
sandbar shark (*Charcharinus plumbeus*)		x		x
sand tiger shark (*Odontaspis taurus*)		x		

Source: USDOC, 1999.

In addition to impacts on fish and benthic macroinvertebrates, turbidity resulting from suspension of sediments during in-stream activities or erosion of cleared rights-of-way could reduce light penetration, possibly reducing photosynthetic oxygen production. Resuspension of organic and inorganic materials can cause an increase in biological and chemical uptake of oxygen, resulting in a decrease in available dissolved oxygen. Biological and chemical uptake of oxygen typically occurs in ponds, lakes, reservoirs, and slow moving streams with thick organic sediment deposits. Therefore, the streams crossed are not expected to experience oxygen depletion for existing biota.

Offshore

Direct impacts on offshore aquatic environments related to pipeline installation between MPs 12.00 and 32.15 would vary depending on the use of the jetting and subsea plow methods. The jetting construction method would require up to two passes of the jetting sled to create a 40-foot-wide by 8-foot-deep trench, and deposit the majority of trench spoil 130 feet on either side of the trench. Jetting therefore would directly affect a 300-foot-wide corridor and an estimated surface area of 733 acres. Islander East estimated this method would dislodge 661,982 cubic yards of sediment from the 40-foot-wide trench. In section 3.3.3.2, we estimated that one-half of the trench spoil would be deposited 130 feet either side of the trench, which would average 3.9 inches deep if deposited evenly within the area of effect. Alternatively, the subsea plow construction method would also require two passes of the plow, an initial pass to excavate the trench and a subsequent pass to bury the pipe. The subsea plow would create a 25-foot-wide by 8-foot-deep trench, and deposit the majority of trench spoil 25 feet to either side of the trench. Subsea plowing therefore would directly affect a 75-foot-wide corridor and an estimated surface area of 183 acres. Islander East estimated this method would dislodge 504,367 cubic yards of sediment from the 25-foot-wide trench, which would average 20.5 inches deep if all the trench spoil was deposited evenly 25 feet on either side of the trench.

Islander East proposes to install the pipeline by mechanical dredging, using a conventional bucket dredge or clam-shell dredge with no trench shoring between MPs 10.90 and 12.00 and MPs 32.15 and 32.64, and using sheet pile to shore a trench in waters less than 2 feet deep for the beach crossing on Long Island between MPs 32.64 and 32.70. Mechanical dredging would create a trench 50 feet wide by a minimum of 5 feet deep for a conventional trench and 100 feet wide with a variable depth for a floatation trench. Trench spoil would be sidecast to an area 60 feet wide on one side of the trench where a conventional trench is used (MPs 10.90 to 12.00 and 32.15 to 32.58), 90 feet wide on one side of the trench where a deeper floatation trench is required for trenching equipment in waters less than 10 feet deep mean lower low water (MLLW) (MPs 32.58 to 32.64), and approximately 50 feet wide on one side of the trench, as well as adjacent onshore spoil storage areas, where sheet pile would be used to shore the trench in waters less than 2 feet deep (MPs 32.64 to 32.70). Islander East estimated conventional trenching would dislodge 69,345 cubic yards of sediment from the 50-foot-wide trench, which would average 46.4 inches deep if all trench spoil were deposited evenly 60 feet on one side of the trench, affecting a deposition area of 21.3 acres. Islander East estimated floatation trenching would dislodge 20,019 cubic yards of sediment from the 100-foot-wide trench, which would average 18.8 feet deep if all trench spoil were deposited evenly 90 feet on one side of the trench, affecting a deposition area of 1.5 acres. Islander East estimated conventional trenching using sheet pile for trench shoring would displace 150,000 cubic yards of sediment from the trench, which would be comparably deep to the conventional trenching without shoring if all trench spoil were deposited evenly 50 feet on one side of the trench, affecting an offshore deposition area of 0.34 acre.

In the case of the jetting, subsea plow, and mechanical dredging construction methods, trenching (all construction methods) and backfilling (subsea plow and mechanical dredging construction methods only) would dislodge and likely result in direct mortality of some mobile shellfish (i.e., lobster, crab, scallop), and the majority of sessile shellfish attached to substrate (i.e., mussels, oysters) or semi-mobile shellfish (i.e., soft clams, hard clams), present in the trench area. The average trench spoil deposition of 3.9 inches resulting from the jetting method likely would result in mortality to less mobile and sessile shellfish in the area of effect, although it is likely that many mature hard clams would survive if buried because they are capable of escaping 4 to 19.5 inches of burden (Stanley and DeWitt 1983). Additionally, hard clams in turbid waters are capable of closing their shells to avoid sediment ingestion and expelling pseudofeces at a rate of 107 times per hour, 19 times per hour, and 7 times per hour in mud, fine sand, and coarse sand, respectively (Stanley and DeWitt 1983). The average deposition of 20.5 inches from the subsea plow method, 46.4 inches from the mechanical dredging-conventional trench method, 18.8 feet from the mechanical dredging-floatation trench method, and a comparable depth for the mechanical dredging-sheet pile trench method could bury and asphyxiate the majority of sessile and less mobile shellfish present in the area of effect, whereas many mobile shellfish would avoid the construction area and survive.

The placement of the pipeline across the Sound would result in a short-term, one time impact to the benthic macroinvertebrate species at and near the footprint of the proposed project. As discussed above, most of the pipeline would be buried beneath the sea floor from either jetting or the subsea plow construction method. The jetting method would stir both bottom sediments and benthic macroinvertebrates into the water column altering the living habitat and potentially cause mortality to existing benthic macroinvertebrates. In addition to direct mortality, a dredging study was conducted and found fish species being attracted to feed on the infaunal organisms that were dislodged from the bottom (Brinkhuis, 1980). Benthic maroinvertebrates that survived the jetting water blast and predation would settle and establish in the sea floor adjacent to the pipeline trench.

Impacts to benthic macroinvertebrates from subsea plow construction would be less drastic than from jetting. Direct mortality from subsea plow construction would be less because the pipeline trench would be created from excavation and not from high-pressure water blasting for removal of sand. However, similar to jetting, some infaunal organisms would be dislodged from the bottom and preyed upon during construction.

As stated in section 3.3.3.2, we conducted an independent analysis of potential turbidity plumes that would be generated during construction of the offshore Islander East Pipeline compared with the results of turbidity plume modeling conducted for the Eastchester Project (Docket No. CP00-232-000). We estimated that the jetting construction method would produce a maximum turbidity plume about 7,800 feet long by 1,900 feet wide, and mechanical dredging would produce an estimated maximum turbidity plume about 2,600 feet long by 1,300 feet wide. Subsea plowing would produce a maximum turbidity plume smaller than that generated by jetting, and similar to that generated by mechanical dredging, because plowing does not fluidize bottom sediments. Because the turbidity plume itself would be visible (i.e., greater than 29 NTU), sight feeders (e.g., summer flounder) would experience a temporary reduction in localized foraging success within the plume and would be expected to seek alternative sites for food. Additionally, because the turbidity plume would consist of greater than 30 mg/L of total suspended sediments, it could cause gill abrasion and associated loss of capacity for ion regulation to fishes in the plume (Newcombe and Jensen 1996). Larval or juvenile benthic macroinvertebrates and fishes may deliberately or incidentally ingest suspended particles. Ingested particles would occupy gut space and reduce foraging efficiency until passed through, or cause mortality by weighing down larval or juvenile organisms or causing them to sink to the seafloor. However, fish tend to avoid high concentrations of suspended sediment when possible (Newcombe and Jensen 1996). These turbidity related impacts also would be temporary because the fine-grained sediments in the turbidity plume likely would settle at a rate ranging between 0.06 mm/second to 2.02 mm/second and become completely dispersed between 0.3 to 7.7 days after jetting, although resuspension by wind and site-specific conditions may extend this duration (Teeter, 1993). The size of the area affected and duration of turbidity plume impacts would be less for the mechanical dredging and subsea plow methods compared with jetting.

The turbidity plume likely would deposit a relatively thin layer of sediment over a broad area. The broad area affected by sedimentation and associated depth of sediment deposition would depend on the height, width, length, duration, and movement of the plume, which in turn would depend on a variety of factors such as bottom current speed and direction, water temperature, salinity, and sediment grain size composition. The jetting method would produce the largest plume of any construction method (maximum about 7,800 feet long by 1,900 feet wide), whereas mechanical dredging would produce a significantly smaller plume (maximum about 2,600 feet long by 1,300 feet wide), and subsea plowing would be expected to produce a maximum turbidity plume about the same size as that generated by mechanical dredging. Assuming the plume would move to one side of the trench and primary trench spoil deposition area (i.e. 130 feet for jetting, 25 feet for plowing, and 60 or 90 feet for mechanical dredging), sediments would be deposited in a relatively thin layer away from the construction corridor for a distance of up to 7,670 feet for jetting, 2,575 feet for subsea plowing, and no more than about 2,500 feet for mechanical dredging. Between MPs 12.00 and 32.15, turbidity plume sediment (estimated as one-half the sediment dislodged by trenching) could be deposited at an average depth of 0.13 inch over 18,733 acres for jetting and an average depth of 0.30 inch over 6,289 acres for subsea plowing. Between MPs 10.90 and 12.00 and MPs 32.15 and 32.70, turbidity plume sediment could be deposited at an average depth of 0.37 inch over 507 acres for mechanical dredging.

Barge Anchoring and Cable Sweep Impacts

In addition to impacts from trenching of the sea floor, a short-term, one time impact is also expected from anchoring and cable sweep of the lay and bury barges. Impacts associated with the anchors and cable sweep would be similar for both trench construction methods. Offshore pipeline installation activities would result in 2,628 anchor scars along a 21.9-mile portion of the Sound crossing, affecting approximately 10 acres of soft (non-live) sea floor. To minimize the area of cable sweep impact, Islander East proposes to conduct pipe laying, trenching (by plowing or jetting), and burial using mid-line buoys on anchor lines. These mid-line buoys would keep the anchor cables from making contact with the sea bottom for all but a relatively small portion of the distance from the barge to the anchor. By using mid-line buoys with the subsea plow method, Islander East would reduce cable sweep impacts to soft bottom in the Sound from an estimated 5,915 acres down to an estimated 2,802 acres. In both cases, benthic marcroinvertebrate recolonization of the disturbed area would take place immediately following construction (Brinkhuis, 1980). The rate of recolonization would depend upon the sediment, current, and recruitment rate of the project area. In most areas, benthic macroinvertebrate composition would remain the same as pre-construction conditions because organisms would be recruited from adjacent areas. However, post-construction benthic communities in some areas would consist of different species as opportunistic species would recolonize the open space. Mobile benthic macroinvertebrates buried as a result of the subsea plow method would be able to maneuver up the sediment and survive, whereas buried sessile species would suffocate and die. See below for further discussion of impacts to commercial shellfish beds.

Acoustic Shock

Acoustic shock impacts are typically associated with stream crossings that require blasting of bedrock. The degree of impact would depend on the type of explosive, blasting technique, timing, and fish, shellfish, and macroinvertebrate species present. Telki and Chamberlain (1978) found laterally compressed fish (e.g., pumpkinseed and crappies) to be the most sensitive to blast-related acoustic shock and would suffer 95 percent mortality within 213 feet of the detonation, decreasing to 10 percent mortality at 472 feet of the detonation. The least sensitive fish were those with more round body forms (e.g., suckers and catfish) which would suffer 95 percent mortality within 174 feet of the blast, dropping to 10 percent mortality at 194 feet. Telki and Chamberlain (1978) suggest that construction activities in the stream area (i.e., drilling for the blast charges) would scare most fish out of the area prior to detonation.

Although no blasting is expected at freshwater stream crossings along the Islander East Pipeline route, should Islander East encounter unanticipated in-stream bedrock, blasting would be performed by registered licensed professionals who would secure any necessary permits and comply with legal requirements in connection with the transportation, storage, and use of explosives, and blast vibration limits for nearby structures and utilities. Islander East would use delayed detonation and stemming to reduce the total acoustic shockwave intensity to the greatest extent possible.

Ocean Surveys, Inc. (2001) conducted a marine geophysical survey of the proposed offshore pipeline route and alternatives within the Sound and found that the majority (98 percent) of bottom habitat crossed consists of soft bottom substrate composed of unconsolidated sediments with no blasting requirements. However, rocky subtidal habitat is located near the Connecticut shoreline between approximate MPs 10.1 to 10.9.

Although Islander East will use the HDD construction method to avoid impacts to the rocky subtidal habitat, blasting in the Sound may be necessary where unanticipated bedrock is encountered. Blasting in the Sound would be performed by registered licensed professionals who would secure any necessary permits and comply with legal requirements in connection with the transportation, storage, and use of explosive, and blast vibration limits for nearby structures and utilities. Islander East would use delayed detonation and stemming to reduce the total acoustic shockwave intensity to the greatest extent possible. Blasting in the Sound would not be conducted within 1,500 feet of any moving vessels except those associated with the blasting operation or while swimming or diving operations are in progress in the vicinity of the blasting area.

We believe the use of the proposed mitigation measures would adequately avoid or minimize potential blasting impacts on warmwater, coldwater, diadromous, and marine fisheries.

Habitat and/or Cover Loss

Impacts to submerged aquatic vegetation, logs, rocks, and undercut banks of streams are expected as a result of the construction activities. Some stream shoreline and benthic cover would be altered or lost as a result of the stream crossings. However, these effects would be relatively minor because of the small area affected in respect to the overall habitat of the stream. Fish that normally reside in the impacted areas would be temporary displaced. Islander East and Algonquin would limit vegetation maintenance on streambanks, allow long-term revegetation of all shoreline areas with native herbaceous and woody plant species, and restore all streams to pre-construction conditions.

Construction within the Sound would primarily disturb soft bottom habitats. Islander East would use the HDD construction method to avoid and minimize impacts to rocky subtidal habitat, seagrass beds, and shellfish lease beds. Dredging and construction of the Long Island shore of New York would have a short-term temporary impact on the intertidal and subtidal habitats. Dredged beachfront areas would be restored to pre-existing conditions upon completion of the project. We believe the use of the proposed mitigation measures required in the ESC Plan, and data gathered from Islander East's Study Plan for the Islander East Pipeline Project would adequately monitor and minimize cover loss impacts on fisheries, shellfisheries, and benthic macroinvertebrates.

Once in place, the areas of partially buried pipeline can have a positive impact on marine habitat. The protective layer of stone rip-rap or concrete mats that would be placed over the pipeline for protection would be beneficial for both fish and shellfish. Some species such as oysters, mussels, and barnacles would flourish on the newly constructed stone rip-rap, and some fish (black sea bass) and shellfish (lobster) species would use the stone rip-rap as food source and as shelter from predators.

Other Impacts

Other potential effects of construction include interruption of fish spawning migration; entrainment of fish; fish, shellfish, and benthic macroinvertebrate mortality from toxic substance (fuel) spills; and introduction of non-native species to the marine environment.

Specific waterbody and Sound construction schedules would be developed in coordination with Federal and state agencies. To minimize potential interference with fish migration and spawning during construction, in-stream construction of coldwater streams and rivers would be conducted between June 1 and September 30, and construction in warmwater streams and rivers would be conducted between June 1 and November 30. Other time windows may be used if permitted or required by state agencies. Due to the importance of the coldwater fishery at the Carmans River, the NYSDEC does not permit any in-stream construction activity in the river. Therefore, Islander East would use the HDD technique to complete this waterbody crossing.

Use of the HDD construction method typically avoids disturbance to the bed and banks of the waterbody being crossed. However, if a natural fracture or weak area underground is encountered, an unexpected release of drilling mud to the environment could occur. The volume of mud released is dependent on a number of factors, including the size of the fracture, the permeability of the geologic material, the viscosity of the drilling mud, and the pressure of the hydraulic drilling system. Releases to the ground generally occur above or near the drill path. In the event of a release to a waterbody, Islander East would attempt to plug the fault by adding thickening agents to the drilling mud, such as additional bentonite, cotton seed hulls, or other non-hazardous materials that are compatible with the drill equipment being used. We believe the use of the measures identified in Islander East's ESC Plan, specified construction windows, and specialized construction techniques would provide adequate protection to fish migration and spawning.

Entrainment of fish during construction could occur during withdrawal of water for hydrostatic testing. However, water intakes would be screened to prevent the potential for entrainment of localized fish. In addition, water for hydrostatic testing would be withdrawn from larger waterbodies, therefore the quantity of water withdrawn would not significantly reduce stream flow, and adequate flow rates would be maintained to protect aquatic life.

Depending on the type, quantity, and concentration of hazardous material spills, direct spills into waterbodies and the Sound could be toxic to fish, shellfish, and benthic macroinvertebrates. To reduce the potential for direct surface water contamination, Islander East would refuel equipment and store fuel and other potentially toxic materials at least 100 feet from waterbodies onshore, or would implement the special precautions outlined in its ESC Plan. We believe use of the measures identified in the ESC Plan would adequately minimize potential hazardous materials spills and associated impacts on fish, shellfish, and benthic macroinvertebrates.

Deepwater pipeline installation in Long Island Sound would require two barges working in tandem. A lay barge (approximately 400 feet long by 400 feet wide) will be required to weld the pipeline together and set it on the sea floor while the bury barge (also approximately 400 feet long by 400 feet wide) will follow and excavate a trench under the pipeline, at least partially burying the pipeline to complete installation. Alternatively, the lay barge may be used to first weld and lay the pipeline and then return along the pipeline to bury it. Large marine vessels have been known to introduce non-native marine species that are detrimental to existing native marine species. Because the Sound is a complex and symbiotic estuary that provides habitat for numerous native marine fish, shellfish, and macroinvertebrate species that could be adversely affected by introduced exotic marine species, Islander East would comply with the National Invasive Species Act of 1996. We believe that this would adequately minimize potential impacts from non-native marine species.

Commercial Fisheries/Shellfish Beds Impacts

Trenching Impacts

Commercial fishing, including shellfishing, is an important industry in this region of Connecticut and New York. The Sound pipeline segment would cross seven shellfish lease areas (included in table 3.8.3-1). However, two of these lease areas have been unlisted by the State of Connecticut because they are unproductive shellfish beds, and therefore the pipeline crossing would not affect shellfishing in these areas. Islander East would avoid four of these areas by using the HDD crossing methods at the Connecticut shore. The pipeline would cross only the southeast corner of shellfish lease bed L-555 for a distance of 2,216 feet between MPs 12.60 and 13.02. If jetting is used, the 300-foot-wide jetting method corridor would impact 15.3 acres of shellfish lease bed L-555, whereas the 75-foot-wide subsea plow method corridor would impact 3.8 acres of shellfish lease bed L-555. Because of the reduced impact area associated with the subsea plow construction method, **we recommend that:**

- **Islander East should use the subsea plow construction method for pipeline installation near the shellfish lease beds and through any sensitive areas of the Long Island Sound designated by state and/or Federal agencies.**

Islander East states it would continue to work closely with the lease holder of shellfish lease bed L-555 to coordinate construction plans and timing of construction to minimize impacts to the use of this area. Therefore, **we recommend that:**

- **Before construction, Islander East should file with the Secretary the final plan for crossing shellfish lease area L-555 at MP 12.6, and documentation of consultation with the lease holder on the final plan.**

Once construction is complete, recruitment by larval stages of affected shellfish species (i.e., primarily hard clams) from adjacent communities would take place immediately and full recovery of affected shellfish lease beds would be expected to occur within 2 to 3 years after construction (Dean and Haskin, 1964; Dean and Simon, 1976; Emerson and Grant, 1991;Gagnarsson, 1995; Reilly and Bellis, 1983; Rakocinski et al. 1996; Saloman and Naughton, 1984; Sanders et al. 1962).

In addition to direct impacts to shellfish beds from trench construction, the deposition of sediments from the turbidity plume associated with trench construction could affect shellfish beds. Based on the estimates of turbidity plume dimensions and expected sedimentation discussed above, turbidity plume sedimentation would be expected to affect 390 acres (for the jetting method) or 131 acres (for the subsea plow method) of shellfish lease area L-555 between MPs 12.60 and 13.02. No other actively cultivated shellfish lease areas are located on or within 1,000 feet of the offshore pipeline route, however, numerous shellfish lease beds are located within 1 mile of the pipeline route between MPs 10.2 and 10.9 where the HDD method would be implemented. The turbidity plume would deposit sediment at average depths of 0.13 inch for jetting or 0.30 inch for subsea plowing in shellfish lease area L-555 and other lease beds up to 7,670 feet (for the jetting method) or 2,575 feet (for the subsea plow method) away from the pipeline route between MPs 10.2 and 10.9. Hard clams are the primary shellfish actively cultivated in affected lease beds (Volk, 2002), and they are capable of burrowing and escaping sediment of such limited depth (Stanley and DeWitt 1983). Therefore, turbidity plume deposition would be expected to result in only partial and minor burial of actively cultivated shellfish beds.

To further define potential areas and quantities of project-induced sediment resuspension, transport, and deposition, and to assess the significance of impacts on commercial fishing and shellfish lease areas, Islander East proposes to conduct sediment deposition modeling using site-specific data currently being collected through field studies in the Sound. Therefore, **we recommend that:**

- **Islander East should file with the Secretary, prior to issuance of the final EIS, the results of the offshore sediment deposition studies as described in the Study Plan, including an assessment of potential impacts to shellfish beds and other fisheries. Provide an estimate of the locations, types, duration, and quality of the identified impacts.**

Anchor Scar and Cable Sweep Impacts On Shellfish Lease Bed L-555

Islander East predicted that construction barge anchor scars would be up to 8 feet deep and affect about 172 square feet (8.6 feet by 20 feet) each. Using the average 10-anchor array and resetting the anchors three times per mile proposed by Islander East, each pass of offshore pipeline construction and burial barges would create an average of 30 anchor scars per mile. Allowing for a total of four passes (one by a pipe lay barge, two by plow or jet, and one by a bury barge), offshore pipeline installation activities would result in 120 anchor scars per mile. Therefore, offshore pipeline construction along the 2,216-foot-long crossing of shellfish lease bed L-555 would result in a total of 50 anchor scars within the lease bed, totaling 0.2 acre of direct impact. Due to the weight of the anchor and the depth of the scar, the impact on shellfish likely would be complete mortality within the footprint of the scar. Similar to jetting, subsea plowing, and mechanical dredging, re-colonization and recruitment of shellfish would take place immediately following completion of construction and full recovery of affected shellfish lease bed L-555 would be expected to occur within 2 to 3 years after construction.

Islander East predicted the area to be affected by cable sweep to be relatively extensive, up to 2,500 feet to the front and back and up to 2,000 feet to either side of the barge between MPs 10.90 and 32.15. Many benthic fauna along this portion of the route and shellfish (i.e., primarily hard clams) in lease area L-555 between MPs 12.60 and 13.02 would be expected to experience mortality as a result of direct impact with, or being dislodged by, sweeping cables. It is expected for the area of cable sweep that some areas of benthic fauna and the shellfish lease bed would survive relatively intact (e.g., areas within depressions and areas where the cable does not make complete contact). A short-term impact is expected from the cable sweep because benthic fauna and shellfish would completely re-colonize affected areas within 2 to 3 years following completion of construction. As discussed in section 3.3.3.2, Islander East's proposed use of mid-line buoys would reduce cable sweep impact to soft bottom in Long Island Sound by about 50 percent (3,113 acres) from an estimated 5,915 acres to an estimated 2,802 acres. Similarly, cable sweep impact to shellfish lease bed L-555 would be reduced from 121 acres to 61 acres.

Marine Migration Impacts

The NMFS and local interest groups are concerned with the potential of the exposed sections of the pipeline to hinder American lobster and flounder (i.e., winter flounder, summer flounder, and windowpane) migration. The Islander East Pipeline would be concrete coated and partially buried to at least one-half its diameter for most of the route from MPs 10.9 to 32.0. Although this portion of the partially buried pipeline would permanently protrude above the sea floor, it would create a potential maximum barrier only approximately 20 inches tall by 38 inches wide on the sea floor. At MPs 25.9 and 26.9 the Islander East Pipeline would cross telecommunications cables. In these areas, the pipeline would not be buried. Instead, the pipeline would be laid on the sea floor over the existing utility lines with a concrete separation barrier placed between the utility line and pipeline. In these areas, the pipeline would create a potential maximum barrier approximately 32 inches tall by 38 inches wide on the sea floor.

Changes in water temperature stimulate lobster migration from warmer shoal waters to deeper waters during the winter season (McKenzie and Moring 1985). Lobster in the Long Island Sound have been known to migrate over 120 miles from the Long Island Sound to Veatch Canyon (The Lobster Conservancy 2002). Although lobsters are benthic crustaceans not known for their swimming capabilities, they posses a strong, powerful tail which they propel through the water column to escape from predators. Herrnkind (1970) found that migrating lobsters maintain a bearing while moving over substrate of variable slope and at varying depths, in water visibility less than six feet, under completely overcast skies, and in areas of complex currents. Similar to the American lobster, changes in water temperature stimulate flounder migration. Winter flounder (Pereira et al. 1999), summer flounder (Packer et al. 1999), and windowpane (Chang et al. 1999) are benthic species and strong swimmers with the capability of migrating from the outer continental shelf to inshore waters for food and to spawn. Based on recent studies conducted of winter flounder migration, tagged flounder have been confirmed to migrate a distance of over 200 miles to spawn in Southern New England and New York waters (Pereira et al. 1999). Winter flounder are capable of swimming 25 miles in one season in the New York Bight, which is comparable to Saila's dispersion coefficient of over 1.7 square miles per day, indicating non-directional movement (Phelan 1992). As a result of their routine migration habits and strong swimming abilities, American lobster, summer flounder, winter flounder, and windowpane would be capable of easily swimming over or around a 20-inch-tall obstacle, such as the partially buried pipeline. If necessary, Islander East also would consult state permitting agencies to evaluate burial options to further minimize potential impacts on lobster and flounder migration. We believe complete burial of the pipeline between MPs 10.1 to 10.9 and 32.0 to 32.8, and partial burial of the pipeline to at least one-half its diameter between MPs 10.9 and 32.0, would adequately minimize potential impacts of pipeline installation on lobster and flounder migration.

EFH-Designated Species

The limits of potential impacts to EFH-designated species associated with the Islander East Pipeline Project would be confined to the waters of the Sound. EFH-designated species could be impacted by direct mortality or physical injury, or direct or indirect disturbance to feeding, spawning, and living habitats.

As a result of the proposed project, sedimentation and turbidity within and adjacent to the proposed pipeline route are expected to increase causing a short-term, temporary impact to EFH-designated species and food sources. Sedimentation caused by the proposed project is expected to quickly settle out of the water column, and therefore would not result in any long-term adverse effect on sight feeding EFH species. Juveniles and adults of EFH-designated species are highly mobile and would avoid the project area and seek alternative sites for food and living habitat. Upon completion of the proposed project, recolonization of disturbed habitat by shellfish and benthic macroinvertebrate is expected to take place immediately. Recruitment of shellfish and benthic macroinvertebrate would be from individuals adjacent to the project area.

If present, eggs and larvae of EFH-designated species within the proposed pipeline route could be adversely impacted by the proposed project during construction. EFH-designated species' eggs that settle to the bottom (e.g., winter flounder) and larvae (lethargic compared to juvenile and adult life stages) could be injured by construction equipment or suffer mortality. In addition, increased sedimentation would be detrimental to eggs and larvae by decreasing available dissolved oxygen and causing gill damage, therefore possibly causing mortality.

Blasting and construction of rocky subtidal habitat would directly disturb and destroy local submerged aquatic vegetation (e.g., eelgrass and *Ulva*), shellfish (e.g., blue crab, American lobster, and oyster), and benthic macroinvertebrates that utilize rocky habitat for food and shelter, and result in temporary displacement of living habitat and food sources for some EFH-designated species (e.g., black sea bass). However, similar to the sandy bottom of the Sound, recolonization of rocky habitat is expected to take place immediately after completion of construction, and therefore would not result in long-term significant impact on food availability for EFH-designated species.

The FERC, as the lead Federal agency under NEPA, is in the process of submitting an EFH Assessment to the NMFS to initiate formal EFH consultation (see appendix I for our EFH Assessment). Preliminary EFH Assessment results indicate that no long-term adverse impacts to EFH-designated species are expected as a result of the Islander East Pipeline Project. Due to their habitat utilization, winter flounder and windowpane are expected to spawn in or adjacent to the project area. The spawning periods for winter flounder (January to May) and windowpane (February to November) overlap with the scheduled Long Island Sound construction (November 2002 to April 2003). However, the area of suitable winter flounder and windowpane spawning habitat located along the portion of the pipeline route that would be trenched is insubstantial in relation to suitable habitat available in the entire Sound. Fertile males and gravid females would likely avoid the pipeline construction area and relocate to other available suitable habitat in the Sound to spawn. Islander East stated it would consult with the NMFS to minimize potential impacts on EFH-designated species and to facilitate development of conservation recommendations by the NMFS. Therefore, **we recommend that:**

- **Prior to construction, Islander East should file with the Secretary copies of all correspondence with the NMFS regarding measures to minimize potential impacts to EFH-designated species.**

3.4.2 Wildlife

3.4.2.1 Existing Environment

Wildlife species inhabiting the Islander East and Algonquin project areas in Connecticut and New York are those characteristic of deciduous, coniferous, and mixed forest, early successional, wetland, riparian habitat, and marine habitat (see section 3.5.1, Vegetation, and section 3.7.1, Wetlands, for additional description of vegetative cover types).

Forested habitat is found at many locations along the proposed pipeline route and consists of hardwood, conifer, and mixed species stands. Representative bird species include the woodcock, ruffed grouse, wood thrush, summer tanager, red-eyed vireo, blue-gray gnatcatcher, Carolina wren, and eastern towhee. Typical mammals include the gray squirrel, red squirrel, eastern chipmunk, pine vole, raccoon, and white-tailed deer (USDA, 1979; USFS, 1995). Characteristic raptors include barred owl, great-horned owl, and red-shouldered and broad-winged hawks. Early succession habitat consists of active and idle agricultural fields, livestock pastures, and existing powerline and pipeline rights-of-way. Typical wildlife attracted to openland habitat include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox (USDA, 1979; USFS, 1995).

Wetland habitats along the pipeline route include palustrine forested, scrub-shrub, and emergent vegetative communities. The increased availability of water in these areas provides more abundant and diverse habitat for a variety of resident and migratory wildlife species. Many wildlife species from other adjacent habitats use wetlands as a water resource; others use wetlands exclusively, and many fish, amphibians, aquatic reptiles, and some bird species are dependent on the water resource. Representative wildlife species that are highly dependent on wetlands for water or nesting include ducks, geese, herons, shore birds, muskrat, mink, and beaver (USDA, 1979).

Many of the wildlife species associated with wetlands use riparian corridors for foraging, nesting and breeding, and cover. Numerous wildlife species also use the vegetation and cover provided by riparian corridors for dispersal and migration. The pipeline would cross many riparian systems, from small drainage (5 to 10 feet wide) to major waterbody crossings such as Muddy, Farm, and Branford rivers. Often these riparian systems are associated with wetlands and are an integral, hydrologic component of the wetland system. Representative wildlife species that can be found in these riparian systems include ducks, geese, muskrat, mink, racoon, and beaver.

Many of the bird species (e.g., warbler, vireo, tanager) potentially occurring along the proposed Islander East Pipeline Project corridor are migratory. Migratory birds are those species that nest in the United States and Canada during the summer, then migrate south to tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Many bird species pass through the project area during migration to and from tropical regions. Additionally, some migratory bird species may nest within the project area during the breeding season.

No national wildlife refuges or state wildlife management areas would be crossed by the Islander East Pipeline Project. However, the project would cross notable wildlife habitat, including the Central Pine Barrens and the Sound. The Central Pine Barrens in New York is comprised of mostly pitch pine woodlands, pine-oak forests, swamps, marshes, and bogs and would be crossed by the pipeline between MPs 34.4 and 42.7 and MPs 42.8 and 43.3. Representative species that may specifically occupy the pine barrens include Fowler's toad, pine warbler, whip-poor-will, masked shrew, and eastern mole (Central Pine Barrens Joint Planning and Policy Commission [CPBJPPC], 1996; Reschke, 1990).

Wildlife species inhabiting the Islander East Pipeline Project area in the Sound are those characteristic of mudflat, marsh, and marine habitats. Game and commercial finfish and shellfish known to inhabit the Sound are described in section 3.4.1. Representative mudflat and marsh bird species include, yellowlegs, ruddy turnstone, sanderling, black skimmers, red knot, and various plovers, sandpipers, and phalaropes. Representative pelagic and intertidal seabirds include shearwaters, petrels, northern fulmar, gannet, brown pelican, cormorant, and various waterfowl, gull, and tern species. Harbor seals, protected under the Marine Mammal Protection Act of 1972 (Amended 1994), are the only marine mammals that occur regularly within the project corridor. In the Sound, harbor seals occur most frequently from November through May.

3.4.2.2 Environmental Consequences

Construction and operation of the Islander East and Algonquin project facilities would result in temporary and permanent alteration of wildlife habitat, as well as direct impact on wildlife such as disturbance, displacement, and mortality. The clearing of the right-of-way vegetation would reduce cover, nesting, and foraging habitat for some wildlife. During construction of the proposed facilities, the more mobile species would be temporarily displaced from the construction right-of-way and surrounding areas to similar habitats nearby. Some wildlife displaced by construction would return to the newly disturbed area and adjacent, undisturbed habitats soon after completion of construction. Less mobile species, such as small mammals, reptiles, and amphibians, as well as bird nests located in the proposed right-of-way, could be destroyed by construction activities. Routine maintenance activities on the permanent right-of-way would have similar but less extensive effects on wildlife species in the area, depending on the time of year. However, the overall impact on general wildlife would be temporary and not significant due to the short duration of the activities and availability of undisturbed similar habitats adjacent to the right-of-way from which the affected species would return and recolonize the disturbed right-of-way.

In forested areas, the principal impact on wildlife of the increased or new right-of-way clearing would be a change in species using the right-of-way from those favoring forest habitats (e.g., downy woodpecker, red squirrel) to those using edge habitats and more open areas (e.g., eastern cottontail, meadowlark). Many species adapt well to this habitat reversal and take advantage of the increased populations of small mammals that prefer open areas. Predatory species such as the red-tailed hawk, coyote, and gray fox commonly use utility rights-of-way for hunting.

Although the project may be advantageous for some species, it would create new cleared rights-of-way or widen existing cleared rights-of-way, which may affect some forest interior species, or species that prefer large tracts of unbroken forest. The breeding success of some forest interior bird species (e.g., warblers and thrushes) has been shown to be limited by the size of available unbroken forest tracts (Robbins, 1979; Robbins et al., 1989). For these species, additional loss of forest habitat in tracts of already marginal size could further reduce breeding success. The cleared rights-of-way may also encourage population expansion of parasitic species, such as the brown-headed cowbird. The potential for this type of impact would be greatest where the pipeline would traverse smaller, isolated woodlots (Galli et al., 1976). It may also encourage population expansion of exotic species, such as the house sparrow and European starling, which compete with many native species.

Non-forested habitats that would be affected by construction and operation of the proposed facilities include agricultural areas, non-forested wetlands, open land, and open water. The impact of the proposed project on these habitats and associated wildlife species would be relatively minor and short-term. The temporary alteration of these areas would not have a significant or permanent impact on their wildlife value because the habitat would be returned to previous conditions after construction.

Numerous wetlands and riparian systems would be crossed by the proposed pipeline. These areas are important as year-round habitats for numerous resident wildlife species and are used seasonally as stopovers for migrating waterfowl. Disturbance to these habitats would be minimized through implementation of Algonquin and Islander East's ESC Plan. See section 3.7 for further discussion on wetland impacts.

To minimize the potential impact on migratory bird species that may use the permanent right-of-way for nesting, Islander East would limit routine vegetation maintenance of the right-of-way to once every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in a herbaceous state. In order to minimize disturbances to nesting birds, no routine vegetation maintenance clearing would occur between April 15 and August 1 of any year. To further reduce the impacts on migratory bird species caused by forest fragmentation, Islander East is collocating the proposed right-of-way with existing rights-of-way to the maximum extent possible.

Wildlife occupying the habitats associated with the Sound (e.g., open water, coastal) may be temporarily disturbed during construction, but no permanent impacts including wildlife mortality, are expected. Offshore birds and marine mammals are expected to avoid the area during construction activities. Substrate disturbance may temporarily reduce prey availability near the construction corridor. However, following sediment settling the area should recolonize and return to preconstruction conditions. Overall, we believe that the proposed project would not have a significant impact on wildlife.

3.5 VEGETATION

3.5.1 Existing Environment

Vegetation types that would be affected by the Islander East Pipeline Project include forest (non-agricultural wooded uplands and wetlands), open land (non-agricultural open and scrub-shrub fields and wetlands), and agriculture (see tables 3.8.1-1 and 3.8.1-3). The project would cross a total of about 12.9 miles of forest, 9.3 miles of open land, and 2.9 miles of agricultural land. All of the proposed meter station and compressor station sites would be adjacent to the pipeline rights-of-way and would also affect these vegetative community types. Forested, scrub-shrub, and emergent wetland vegetation types crossed by the pipeline are characterized and addressed in section 3.7, Wetlands.

The project would be within the eastern transitional and mixed deciduous forests and would cross three forest cover types: temperate broadleaf deciduous, coastal oak-mixed hardwood, and pitch pine-oak. Temperate broadleaf deciduous forests generally occur as isolated parcels within agricultural fields or urban areas and are dominated by trees that provide a dense, continuous canopy in summer and shed their leaves completely in the winter. Typical species include beech, sugar maple, oak, hickory, basswood, tuliptree, and buckeye. Prior to the late 1980s, these forests also contained hemlock, most of which have been killed by hemlock woolly adelgid. With the loss of hemlocks, young trees, ferns, and some wildflowers are now more common in woodlots, as more sunlight reaches the forest floor (Branford Land Trust, 2001).

The coastal oak-mixed hardwood forest community in New York is codominated by oaks along with beech, hickory, heath, and/or laurel, and occurs on dry, well-drained, loamy or sandy soils of glacial moraines. The variable subcanopy stratum is usually comprised of small trees and tall shrubs including flowering dogwood, blueberries, and huckleberry. The sparse herbaceous layer in these communities includes Swan's sedge, Canada mayflower, white wood aster, wintergreen, and Pennsylvania sedge (Reschke, 1990).

The pitch pine-oak forest community is dominated by pitch pine with one or more of scarlet oak, white oak, black oak, or red oak as codominants. The shrub layer consists of scattered clumps of scrub oak and a nearly continuous cover of huckleberry and blueberries. Bracken fern, wintergreen, and Pennsylvania sedge generally compose the sparse herbaceous layer. A grassland community is present along the powerline right-of-way near CA MP 0.4. One report (Reschke, 1990) describes small patches of grassland within shrub thickets that are scattered throughout the pitch pine-oak forest community. These grassland communities are generally dominated by big bluestem, common hairgrass, and poverty grass.

Open land within existing rights-of-way may comprise herbaceous species common to disturbed areas, such as little bluestem, spike grass, switchgrass, asters, goldenrods, false indigo, and sweet fern. Other native species include old-field cinquefoil, asters, evening primrose, and ragweed. Weedy non-native species include bluegrasses, timothy, quackgrass, sweet vernal grass, orchard grass, chickweed, Queen Anne's lace, and dandelion. Characteristic woody species include red cedar, blackberry, hawthorne, choke-cherry, serviceberry, sumac, arrowwood, and multiflora rose. Diversity is generally lower in frequently mowed areas and higher at less disturbed sites.

Agricultural land within the project area consists of cropland and hayfields, and may include tree farms and orchards. These areas produce grain and seed crops, grasses and legumes, wild herbaceous plants, and fruit. Common species likely to occur in agricultural lands along the pipeline route include agricultural crops of corn and wheat, additional planted species such as fescue, clover, and alfalfa, and wild herbaceous plants, including bluestem, goldenrod, wheatgrass, and grama (USDA, 1979).

The Connecticut Invasive Plant Working Group (CIPWG) maintains a list of invasive or potentially invasive species in Connecticut (CIPWG, 2001). Although the list does not have legal status, species on the list that may occur within the pipeline corridor include garlic mustard, oriental bittersweet, common reed, purple loosestrife, spotted knapweed, honeysuckle, multiflora rose, buckthorn, autumn olive, black locust, Norway maple, and poison ivy. These species typically inhabit disturbed areas such as wetlands and other moist soil areas. The invasive common reed has been successful in out-competing native cordgrass in some coastal marshes. Purple loosestrife is a common invasive species in emergent wetlands in the vicinity of the pipeline route, particularly in wetlands that have experienced past disturbance.

The Invasive Plant Council of New York State (IPCNYS) created a list of the 20 most invasive species in New York (IPCNYS, 2001). Although this list does not have legal status, it is generally considered the best reference for invasive plants in the state. Of the species on the list, common reed, autumn olive, honeysuckle, Japanese stilt grass, multiflora rose, Norway maple, oriental bittersweet, and knapweed potentially occur within the project area on Long Island. Similar to species listed for Connecticut, these species also predominantly occupy disturbed areas including roadsides, forest edges, and wetlands or other areas of moist soils.

The Islander East Pipeline Project would cross approximately 8.8 miles of the Long Island Central Pine Barrens. This area is a complex mosaic of pitch pine woodlands, pine-oak forests, coastal plain ponds, swamps, marshes, bogs, and streams. In the frequently burned areas, the dominant tree species is the pitch pine. Pitch pine woodlands are characterized by widely spaced pitch pine which allows abundant sunlight to penetrate the open tree canopy allowing dense growth of various shrub species. The pine barrens of central Long Island are managed under the Long Island Pine Barrens Protection Act which protects, preserves, and enhances the functional integrity of the Pine Barrens ecosystem resources, including plant and animal populations and communities (CPBJPPC, 1996). The management of this area is discussed in section 3.8.3.

3.5.2 Environmental Consequences

Several commentors requested that Islander East evaluate project impacts on vegetation. The Islander East Pipeline Project would result in temporary disturbance to vegetation in Connecticut and New York during construction and, to a lesser degree, during operation and maintenance. Approximately 83 percent of the land route would be adjacent to existing rights-of-way. Vegetative communities outside the maintained portions of the existing rights-of-way include forested, open, and agricultural lands. A total of 139.3 acres of forested land, 91.0 acres of open land, and 40.5 acres of agricultural land would be affected by pipeline, aboveground facility, and access road construction (see tables 3.8.1-2 and 3.8.1-3). Of the 139.3 acres of forest disturbed during construction, about 79.6 acres would be maintained in herbaceous cover and the remaining 52.7 acres would be allowed to revegetate to forest. Specific impacts to vegetated wetlands are discussed in section 3.7.2.

The primary impact on vegetation would be the temporary and permanent alteration of vegetative cover on the right-of-way. In all areas, the construction right-of-way would be cleared of vegetation and then graded to create a level and safe working surface for construction equipment. Forest vegetation in upland areas would be cut at ground level and stacked along the edge of the right-of-way (with landowner approval) or removed to an approved disposal site. Stumps would be removed as needed to maintain a level work surface and either cut flush with the ground using a stump grinder; windrowed along the construction work area; or hauled to an approved landfill. Slash and other vegetative debris would be disposed of by stockpiling adjacent to the construction work area (but not within 50 feet of streams, floodplains, or wetlands), burning, or chipping. Brush would be burned only if permitted by local regulations. In pasturelands, Islander East would remove any cherry (*Prunus* spp.) debris immediately after cutting to avoid contact with livestock.

Following installation of the pipeline and recontouring of the rights-of-way, all disturbed areas would be reseeded. The rate of revegetation would depend on several factors, including local climate, soil type, vegetation maintenance practices, land use, and the existing and seeded vegetation. The amount of time required for complete recovery of the vegetation to preconstruction levels would depend on these factors as well as the size and age of the pre-existing vegetation when cleared. All temporary work areas would be allowed to revegetate naturally to preconstruction conditions following initial seeding. The permanent right-of-way in upland areas would be maintained by periodically clearing woody vegetation for the life of the project. Wetlands would have a 10-foot-wide corridor centered on the pipeline and maintained in a herbaceous condition.

The relative impact of clearing would be greatest in forested areas because the removal of trees would result in the greatest change in the structure and environment of the vegetative community. Moreover, the effect of clearing would be of longer duration in forested areas than in other areas (e.g., agricultural land, open land) and, in the case of maintained (permanent) right-of-way, would be for the life of the project. In temporary work areas where forest regeneration would be allowed following construction, the reestablishment of forest to preconstruction conditions would probably take between 25 and 150 years. In contrast, the reestablishment of old fields, pastures, and rotated croplands following construction typically would require 1 to 3 years.

Islander East would conduct follow-up inspections of disturbed areas after the first and second growing seasons to evaluate the success of restoration after construction. Algonquin and Island East would prepare activity reports during this period documenting problems identified by the company or landowner and describing corrective actions taken to remedy problems, and file these reports with the Commission on a quarterly basis.

The grassland community that occurs along the powerline right-of-way on Long Island and areas maintained by Algonquin as open pipeline right-of-way would be temporarily impacted during construction. However, long-term viability of this community requires disturbance to retard growth of woody vegetation. Therefore, disturbance associated with construction would only have a temporary detrimental effect on the grassland community, and maintenance activities associated with the powerline and new permanent rights-of-way would continue to suppress the growth of woody vegetation.

Several commentors requested that Islander East control invasive plants and promote native plant conservation. Under Executive Order 13112, Federal agencies whose actions may affect the status of invasive species shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species. Additionally, the agency must ensure that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions. Consistent with Executive Order 13112, Islander East has stated that it would minimize the spread of noxious weeds from non-native to native plant communities by consulting with local invasive plant experts, as necessary, to develop control measures.

Within the Central Pine Barrens, Islander East proposes to collocate the pipeline with existing rights-of-way, generally a distance of 30 feet from the white line on the edge of the travel lane on the William Floyd Parkway and 15 feet from the edge of pavement on the Long Island Expressway, to the maximum extent possible. For further discussion on the pipeline alignment through the Central Pine Barrens see section 3.8.3. As a result of these impact minimization measures, the proposed pipeline would affect approximately 133.8 acres of land within the designated boundaries of the Central Pine Barrens. Much of this forested land that would be disturbed by the pipeline follows existing rights-of-way, minimizing impacts to established tracts of forest. Based on review of Islander East's aerial photograph alignment sheets, and proposed pipeline alignment, we estimated that 77.0 acres of forested land would be cleared within the Central Pine Barrens. Islander East has stated it would further assess workspace needs in an effort to minimize tree clearing and would continue to consult with the Pine Barrens Commission to discuss the proposed project and its affects on the Central Pine Barrens. We believe the use of Islander East's proposed alignment reasonably reduces tree clearing and would minimize construction-related impacts to the Central Pine Barrens.

3.6 ENDANGERED AND THREATENED SPECIES

To comply with the requirements of Section 7 of the ESA, we have conducted informal consultation with the U.S. Fish and Wildlife Service (FWS) and NMFS regarding the presence of federally-listed or proposed endangered or threatened species and their critical habitats in the project area. In addition, Islander East and Algonquin, as non-federal parties, have assisted the Commission in meeting Section 7 requirements by conducting informal consultation with the FWS and NMFS, and by reviewing endangered, threatened, and rare species databases maintained by appropriate state Natural Heritage Programs.

3.6.1 Federally Listed or Proposed Endangered and Threatened Species

Based on these consultations, we identified six federally listed endangered or threatened species that potentially occur in the project area. These species, their status, and areas where they may occur along the project are listed in table 3.6.1-1.

A discussion of the loggerhead, leatherback and Kemp's ridley sea turtles, bald eagle, piping plover, and roseate tern, including their range, distribution, habitats, the reasons for their decline, and probable location along the project facilities, is provided below.

Potential habitat for the loggerhead, leatherback, and Kemp's ridley sea turtles along the project area generally include the open water portion of the Sound, except where more detailed habitat requirements are described below. A number of human activities threaten sea turtles population. These include pollution; trawl, purse seine, hook and line, gill net, pound net, longline, and trap fisheries; underwater explosions; dredging; offshore artificial lighting; power plant entrapment; entanglement in debris; loss of nesting habitats; destruction of nests by poachers; ingestion of marine debris; and boat collisions. Examples of threats to nests and nesting beaches include beach erosion; armoring and nourishment of beaches; beach clearing; increased human presence; and recreational vehicles.

Loggerhead Sea Turtle

Loggerhead sea turtles are found in temperate and tropical waters worldwide. Following a 1 to 2-year pelagic stage, adults inhabit nearshore continental shelf and estuarine environments in the Atlantic, Pacific, and Indian Oceans. Loggerheads nest as far north as the Carolinas. Loggerhead sea turtles return to the Sound and Long Island's eastern bays every year in late June, as water temperatures rise and then migrate south to warmer waters by late fall. Although some adults can be found along the ocean shore and in New York Harbor, juveniles occur throughout coastal bays and the Sound. Loggerheads primarily feed on crustaceans and shellfish.

TABLE 3.6.1-1
Federally Listed Endangered or Threatened Species That Potentially Occur in the Vicinity of the Islander East Pipeline Project

Species	Status [a/] Federal	Connecticut	New York	Habitat/Location
Reptiles				
Loggerhead Sea Turtle *Caretta caretta*	FT	ST	ST	Estuaries; Long Island Sound
Leatherback Sea Turtle *Dermochelys coricea*	FE	SE	SE	Estuaries; Long Island Sound
Kemp's Ridley Sea Turtle *Lepidochelys kempi*	FE	SE	SE	Estuaries; Long Island Sound
Birds				
Bald Eagle *Italiaeetus/eucocephalus*	FT	SE	—	Large, mature trees and clean waters
Piping Plover *Charadrius melodus*	FT	---	SE	Maritime beach; New York
Roseate Tern *Sterna dougallii*	FE	SE	SE	Nesting - Falkner Island Foraging - open water; Long Island Sound

a/ Status
FT=Federally listed as threatened
FE=Federally listed as endangered
SE=State listed as endangered
ST=State listed as threatened

Leatherback Sea Turtle

Leatherback sea turtles nest on the shores of the Atlantic, Pacific, and Indian Oceans, typically in the warm sands of tropical beaches. Leatherbacks are common in the waters of the northeastern United States from May through November, and are commonly seen in Long Island's offshore waters during the late summer. Leatherbacks feed primarily on jellyfish, and adults and juveniles seasonally move into coastal waters, including estuaries, to feed on jellyfish.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is found only in the Gulf of Mexico and North Atlantic Ocean, north of the Caribbean Sea. Kemp's ridley sea turtles are the smallest species of Atlantic Ocean sea turtle and have a single primary nesting area, a 10-mile stretch of beach near Rancho Nuevo, on the Gulf coast of Mexico. Although hatching in Mexico, many juveniles travel with the Gulf Stream to Long Island's waters each summer. The waters of Long Island provide important habitat for development of Kemp's ridley sea turtles between 2 and 5 years of age (NYSDEC, 1999). The juvenile Kemp's ridleys that inhabit the Sound prefer "inshore" feeding locations with shallower water, with adults and juveniles feeding extensively on spider crabs. Such areas near the Islander

East Pipeline Project corridor include the lee of the Thimble Islands, the waters around Stony Creek on the Connecticut shoreline, and potentially, in the tidal leads of the Wading River on the Long Island shoreline (NMFS, 2001). Kemp's ridleys migrate south to warmer waters by late fall.

Bald Eagle

Although federally listed as threatened, bald eagles were not identified by the FWS as a species of potential concern for the Islander East and Algonquin project facilities. However, bald eagles were identified by the CTDEP as a state listed endangered species. The bald eagle is found in Connecticut in association with major river systems, lakes, and large reservoirs. Historically, populations of bald eagles were drastically reduced, principally due to low reproductive success as a result of the bioaccumulation of pesticides. Since the banning of organochlorine pesticides such as DDT, populations of this species have been recovering. Habitat fragmentation and loss, collisions with cars and powerlines, and shooting continue to threaten this species. Because bald eagles often return to nest in the vicinity in which they were raised, emphasis has been placed on protecting habitats where successful breeding has been known to occur. Bald eagles have successfully nested (i.e., fledged young) at two confirmed locations in Connecticut, neither of which is located near the proposed project area.

Piping Plover

Piping plovers nest above the high tide line on coastal beaches, gently sloping foredunes, blowout areas behind primary dunes, and washover areas cut into or between dunes (FWS, 1996). These birds generally return to their breeding grounds in late March or early April. Piping plovers generally nest in suitable habitats along the shores of Long Island, including the area of the proposed landfall of the Islander East Pipeline.

Roseate Tern

Roseate terns breed on small offshore islands, rocks, bays, and inlets with nests typically hidden under protective cover such as rocks, vegetation, or washed-up debris. Roseate terns are known to nest on Faulkner Island, which is part of the Stewart B. McGivney National Wildlife Refuge and is located more than 4 miles from the pipeline route. Approximately 150 to 200 roseate terns have nested annually on Faulkner Island for the past decade (FWS, 2001) making it the third largest nesting colony of this species in the northeastern United States. The birds typically arrive on Faulkner Island at the end of April with eggs appearing 3 to 4 weeks later. After hatching, adults forage for fish to feed the young and may travel over 12 miles to foraging areas (Spendelow, 1995).

Roseate tern populations are threatened by competition with gulls, aerial predators, and loss of suitable nesting habitat.

3.6.2 Other Special Status Species

In addition to the 6 federally listed endangered and threatened species, 33 other special status species were identified by the CTDEP and NYSDEC as potentially occurring in the vicinity of the proposed facilities (see table 3.6.2-1). Twenty-nine of these species have been eleiminated from further concern based on the transient habitats of the species or lack of suitable habitat along the proposed project route. These special status species include Federal species of concern and state listed special concern and proposed endangered or threatened species. The state-listed species include 10 birds, 4 reptiles, 2 invertebrates, and 23 plants. These species, their status, and where they possibly occur within the project area are provided in table 3.6.2-1.

3.6.3 General Construction and Operation Impact

Several commentors requested that Islander East and Algonquin evaluate project impacts on endangered and threatened species. The general construction and operational impact of the proposed project as discussed in sections 3.4.2, Wildlife Resources, and 3.5, Vegetation, also apply to endangered and threatened plants and wildlife species. However, because the distribution and abundance of federal- and state-listed endangered and threatened species are limited, any impact could affect the size or viability of these populations. Habitat availability is believed to be the primary limiting factor of some endangered and threatened species. Therefore, the loss or alteration of suitable habitat could contribute to the decline of some species' populations.

3.6.4 Site-Specific Impact

3.6.4.1 Federally Listed or Proposed Endangered or Threatened Species

The proposed Islander East Pipeline route would not cross bald eagle nesting or wintering habitat. The FWS noted the presence of nesting roseate terns on Faulkner Island. The FWS further reported that it is likely that foraging roseate terns would occur within the Islander East Pipeline Project construction right-of-way across the Sound. Construction across the Sound is scheduled to begin in December and be completed by the end of March. Because roseate terns do not generally arrive on Faulkner Island until late April, the potential for this species to be present during construction is remote. This construction schedule would also preclude impacts on piping plovers and the New York state-listed least tern because these species similarly do not initiate nesting until April. The FWS has indicated that it would concur with Islander East that this construction schedule would avoid impacts on the listed migratory birds that nest in or along the Sound (Amaral, 2001). Furthermore, this schedule coincides with the time period when protected sea turtles would not be present within the Sound. Therefore, impact on the three turtle species is not expected.

The FWS recommended that Islander East consider using the power plant intake channel or use HDD at the Long Island landfall to avoid disturbing piping plover habitat. Trenching the Long Island landfall, as is currently proposed, would temporarily disturb plover habitat. However, construction of the Long Island landfall is scheduled to be completed prior to piping plover inhabitation of the area. Additionally, Islander East would return the preconstruction surface materials to the area and restore the area to preconstruction conditions (see ESC Plan). Therefore, habitat disturbance associated with construction is not expected to affect piping plovers. Islander East would evaluate alternative landfall construction methods and locations, and continue consultation with the FWS regarding impact minimization measures. The FWS has indicated that it concurs with Islander East that this construction schedule avoids impacts on the piping plover.

We have contacted NMFS and FWS regarding the need to prepare a biological assessment to determine if the Islander East and Algonquin Project would likely adversely affect federally listed endangered and threatened species. Because potential impacts to listed species for the project area are avoided through mitigation procedures such as construction schedule, both NMFS and FWS have indicated that a biological assessment would not be required (Ludwig, 2002; Amaral, 2002; Stoll, 2002).

TABLE 3.6.2-1
Other Special Status Species That Potentially Occur in the Vicinity of the Islander East Pipeline Project

Species	Status a/ Federal	Connecticut	New York	Habitat/State
Plants				
Button Sedge *Carex bullata*	—	—	SE	Sedge meadow habitat; New York
Yellow Sedge *Carex viridula*	—	SE	—	Moist marshes, pond shores and salt marshes e/
Rose Coreopsis *Coreopsis rosea*	—	—	SR	Pond margin habitat; New York
Carolina Whitlow-Grass *Draba reptans*	—	SC	—	Dry sand and ledges e/
Blunt Spikerush *Eleocharis obtusa v. ovata*	—	—	SE	Pond margin habitat; New York
Three-Ribbed Spikerush *Eleocharis tricostata*	—	—	SE	Pond margin habitat; New York
Wild Ipecac *Euphorbia ipecacuanhae*	—	—	SE	Pond margin habitat; New York
False Mermaid *Floerkea prosepinacoides*	—	SE	—	Dry, open to open-wooded, sandy soils and sand plains b/
Purple Everlasting *Gnaphalium purpureum*	—	—	SE	Wet disturbed pine barrens; New York
Low Frostweed *Helianthemum propinquum*	—	SE	—	Damp, shaded ground and alluvial woods b/
New England Blazing Star *Liatris scariosa v. novae-angliae*	—	SC	—	Dry or sandy soil e/
Dwarf Bulrush *Lipocarpha micrantha*	—	—	SE	Pond margin habitat; New York
Small Yellow Pond Lily *Nuphar microphyllum*	—	SC	—	Open water d/
Clustered Bluets *Oldenlandia uniflora*	—	—	SE	Pond margin habitat; New York
Carey's Smartweed *Polygonum careyi*	—	—	ST	Pine barrens forested wetlands-pond shores; New York
Opelousa Smartweed *Polygonum hydropiperoides v. opelousanum*	—	—	ST	Pine barrens forested wetlands; New York
Water-Thread Pondweed *Potamogeton diversifolius*	—	—	SE	Open water/pond habitat; New York
Silverweed *Potentilla anserina egedii*	—	—	ST	Saltmarsh; New York
Tooth-Cup *Rotala ramosior*	—	—	ST	Pond margin habitat; New York

TABLE 3.6.2-1 (continued)
Other Special Status Species That Potentially Occur in the Vicinity of the Islander East Pipeline Project

Species	Status [a/]			Habitat/State
	Federal	Connecticut	New York	
Small Skullcap *Scutellaria leonardii*	—	SE	—	Dry upland woods and prairies [g/]
Pink Wild Bean *Strophostyles umbellata*	—	—	SE	Sandy shore of ponds; New York
Small Floating Bladderwort *Utricularia radiata*	—	—	ST	Open water/pond habitat; New York
Fibrous Bladderwort *Utricularia striata*	—	—	ST	Open water/pond habitat; New York
Invertebrates				
Coastal Barrens Buckmoth *Hemileuca maia*	—	—	SE	Pitch pine with scrub and tree oaks; New York
Boreal turret snail *Valvata sincera*	—	SC	—	Deep, large, primarily natural lakes with a pH>7.5; often associated with rooted vegetation [d/]
Amphibians/Reptiles				
Tiger Salamander *Ambystoma tigrinum*	—	—	SE	Open water/pond margin and adjacent forest habitat, New York
Loggerhead Sea Turtle *Caretta caretta*	FT	ST	ST	Estuaries; Long Island Sound
Leatherback Sea Turtle *Dermochelys coricea*	FE	SE	SE	Estuaries; Long Island Sound
Kemp's Ridley Sea Turtle *Lepidochelys kempi*	FE	SE	SE	Estuaries; Long Island Sound
Birds				
Northern Saw-Whet Owl *Aegolius acadicus*	—	SC	—	Woodlands with thickets of second-growth or shrubs [b/]
Short-eared owl *Asio flammeus*	—	ST	—	Grasslands, wet meadows, and marshlands [b/]
Salt Marsh Sharp-Tailed Sparrow *Ammodramus caudacutus*	—	SC	—	Marshlands [b/]
Red-Shouldered Hawk *Buteo lineatus*	—	SC	—	Woodlands, wooded rivers, and timbered swamps [b/]
Piping Plover *Charadrius melodus*	FT	—	SE	Maritime beach; New York
Bald Eagle *Haliaeetus leucocephalus*	FT	SE	—	Large, mature trees and clean waters [c/]

TABLE 3.6.2-1 (continued)
Other Special Status Species That Potentially Occur in the Vicinity of the Islander East Pipeline Project

Species	Status a/ Federal	Connecticut	New York	Habitat/State
Least Bittern *Ixobrychos exislis*	—	ST	—	Freshwater and brackish marshes b/
Least Tern *Sterna antillarum*	—	—	ST	Maritime beach; New York
Roseate Tern *Sterna dougallii*	FE	SE	SE	Nesting - Falkner Island/Foraging - open water; Long Island Sound
Common Tern *Sterna hirundo*	—	SC	—	Barrier beaches, natural islands and shoals, and on marsh and dredged material islands c/

a/ Status
FT=Federally listed as threatened
FE=Federally listed as endangered
SE=State listed as endangered
ST=State listed as threatened
SR=State listed as Rare

b/ This species is known to occupy habitat in or near marshes around the Quinnipiac River. Although the Islander East Pipeline Project retest would cross the Quinnipiac River, no vegetation or soil disturbance associated with the project would occur in those marshes. The nearest area of disturbance would be a temporary workspace more than 0.5 mile to the north of potential habitat.

c/ This species is known to occupy habitat associated with the Short Beach Alternative; the proposed pipeline route would not cross habitat for this species.

d/ This species is known to occur in Cedar Lake adjacent to the proposed Islander East Pipeline Project route.

We conclude that implementation of the Islander East and Algonquin project facilities would not adversely impact federally listed or proposed endangered or threatened species and their critical habitats.

3.6.4.2 Other Special Status Species

The CTDEP concurred with Islander East that the project would not adversely affect most of the CTDEP species listed in its correspondence. However, the CTDEP requested surveys for two plant species, the false mermaid and the low frostweed, in the New Haven area. Islander East conducted surveys for these species in July 2001 and summarized the results within the *Connecticut Plant Survey Report* (Islander East, 2001a). The false mermaid and the low frostweed were not found in areas surveyed. Islander East concludes that because these species were not identified within the proposed right-of-way, and the impacts associated with construction of the pipeline would be temporary, it is unlikely that populations of false mermaid and low frostweed would be adversely affected by the project. The CTDEP concurred with the survey's findings (Murray, 2001). We concur.

The NYSDEC has received for review Islander East's determination of effect that habitat for 18 of the 24 species listed by the NYSDEC as potentially occurring in the project area are not expected to be affected by the project. A response from NYSDEC is pending. Islander East determined that surveys for four plant species and one animal species would be required based on potential habitat and historic observations in the project area. These species include the button sedge, purple everlasting, Carey's smartweed, opelousa smartweed, and the tiger salamander.

Islander East conducted surveys for the plant species in July 2001 and summarized the results in the *New York Plant Survey Report* (Islander East, 2001b). The NYSDEC has received this report and a response from NYSDEC is pending. We concur with the survey's findings that implementation of the Islander East Pipeline Project would have no adverse impact on purple everlasting, Carey's smartweed, and opelousa smartweed. However, a population of button sedge was found at the interface of a palustrine emergent and palustrine forested plant community within the Carmans River wetland complex. Islander East's proposed use of the HDD method to install the pipeline beneath the Carmans River wetland complex and the installation of exclusion fencing around this population before construction would avoid impact to this population of button sedge.

Islander East identified potential tiger salamander habitat in the project area. Islander East, in consultation with the NYSDEC, would conduct tiger salamander surveys using approved protocols and qualified individuals in the spring of 2002. Islander East would provide a copy of the report to the FERC and NYSDEC once completed. Therefore, **we recommend that:**

- **Islander East should continue consultation with the NYSDEC regarding the tiger salamander and any other requirements for surveying, monitoring, or avoiding tiger salamanders and their habitats. The results of these consultations, including copies of all correspondence should be filed with the Secretary.**

3.7 WETLANDS

3.7.1 Existing Environment

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (COE, 1987). Islander East used the 1987 COE Wetlands Delineation Manual to identify and delineate wetlands in New York and Connecticut that would be crossed by the project. Table 3.7.1-1 lists each wetland that would be crossed by the proposed project by milepost, wetland type, length of crossing, and acreage affected by construction and operation. Islander East has stated that access permission was requested for all portions of the project on land, and that permission was granted for approximately 25 miles (90 percent). Islander East has also stated that it is in the process of evaluating additional temporary workspaces for the project to determine if they are located within 50 feet of delineated wetlands. We would review all proposed workspaces for placement in relation to wetlands, prior to construction.

Based on the COE wetland delineation and an evaluation of National Wetland Inventory (NWI) maps, aerial photography, and NYSDEC-regulated freshwater wetland maps, the pipeline would cross a total of 43 wetlands for a total crossing length of 3.6 miles, or 12.8 percent of the total length of the pipeline on land (see table 3.7.1-1). These wetlands include 40 wetlands in Connecticut totaling 3.4 miles and 3 wetlands in New York totaling 0.2 mile. No wetlands would be affected by the proposed aboveground facilities.

The majority of wetlands that would be crossed by the pipeline are freshwater palustrine wetland types, including palustrine forested wetlands (PFO), palustrine scrub-shrub wetlands (PSS), and palustrine emergent wetlands (PEM). Palustrine wetlands systems include all nontidal wetlands that are dominated by trees, shrubs, emergent herbaceous plants, and emergent mosses or lichens (Cowardin et al., 1979).